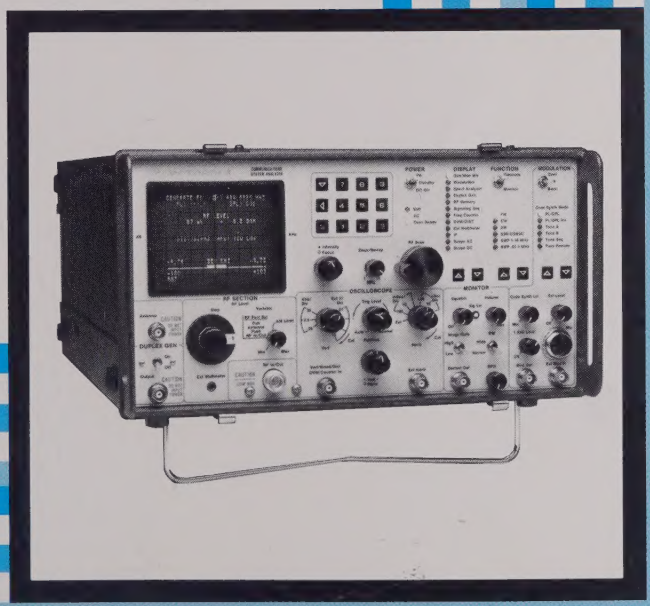
MOTOROLA INC.

test equipment

Trunked Radio Test Option OPERATOR'S MANUAL



R-2021D/0900

68P80310B38-A

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MOTOROLA INC.
Communications Sector

R-2021D/0900 Trunked Radio Test Option OPERATOR'S MANUAL

Motorola
Test Equipment Products

1313 E. Algonquin Rd., Schaumburg, IL 60196

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Section 1
Introduction

Trunking

Trunking is the automatic sharing of a few communication paths (trunks) among many users. Its most important asset is the ability to dramatically reduce channel waiting times, compared to the waiting times in conventional systems. Trunking efficiently distributes the message traffic equally among the available channels because:

a) the percentage of times a user requires the communications link is small.

b) the probability that many users will require a trunk at the same instant is extremely small.

Two-way radio systems use the same techniques of trunking used in telephone applications. In a trunked radio system, the entire system, including mobile radios and fixed equipment, operates under the control of a central controller.

The trunked system usually has a single centralized site, instead of multiple sites or cells. Trunking systems are more dispatch oriented. The sharing of channels is a more efficient way to gain spectrum efficiency and provide better service.

The microprocessor-based central controller directs operation of the trunked radio system and manages the flow of communications including selection and assignment of voice channels among system users. The central controller ensures privacy and eliminates interference by assigning only one group to a voice channel at one time. This results in reliable, simple, and automatic two-way radio communications.

The central controller assigns a communications path, called a repeater, to the party that begins the transmission. If all channels are busy, the radio gives a busy tone. When a channel becomes available, the central controller automatically assigns the radio to that channel and sends a talk permit tone.

When the conversation ends, the repeater is free for assignment to other users. This automatic sharing of frequencies through the use of multiple repeaters and a central controller is the heart of a trunked radio system. Trunked systems offer other advantages including elimination of frequency selection, squelch controls, and channel monitoring.

The main goal of communication trunking is to improve a system's efficiency by sharing its resources among many users. Although telephone companies have used trunking for years, Motorola has pioneered its use in the two-way radio industry.

Signaling Types

Trunk I Signaling

Trunk I signaling is the signaling scheme originally defined for trunking radios. In this signaling scheme, the individual radio units contain preprogrammed fleet, subfleet, and unit ID information. The code plug of each radio in a particular system contains this preprogrammed information. Also included in the code plug are the RF channel identifiers and various system constants.

Note: References to Trunk I & Trunk II used throughout this manual are equivalent to the terms Type I/II and Smartnet I/II which are frequently used within specific Trunked radio systems.

The control channel transmits Outbound Signaling Words (OSWs) to the radio, and receives Inbound Signaling Words (ISWs) from it. In the absence of activity on the system, the central controller continuously transmits OSWs on the control channel.

When the transmitter of a trunked radio is keyed, the radio transmits a Request For Service ISW on the control channel. The request for service ISW contains information about the radio ID, fleet and subfleet, and the purpose (group, system, or individual call) for the requested channel. Upon reception of the request, the central controller queues it for service. The central controller transmits an OSW with the assigned voice channel to the radio requesting service.

In Normal Access, the radio requesting a voice channel moves to the assigned channel and looks for the proper high speed data sequence before transmitting acknowledge tones.

Once it decodes the proper sequence, the radio transmits an acknowledge tone and proceeds with voice. When the central controller decodes the

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acknowledge tone, it replaces high speed data with low speed data. Trunk I signaling is the only trunk signaling that uses Normal Access.

Trunk I EP II Signaling

The references to Trunk I signaling throughout this manual apply to Trunk I EP II signaling also, except where noted. Trunk I EP II Signaling differs from Trunk I Signaling by using Fast Access.

The Fast Access technique allows the radio to begin transmitting more quickly on a voice channel. Trunk I EP II signaling accomplishes this by cutting out the High Speed Handshaking process between the central controller and the radio requesting a voice channel.

The radio requesting a voice channel moves to the assigned voice channel and immediately starts transmitting voice. The central controller transmits only low speed data on the voice channel.

Trunk II signaling uses Fast Access, and it is an option for Trunk I signaling.

Trunk II Signaling

Trunk II signaling breaks away from the fleet/subfleet format used in Trunk I signaling. As a result, size codes are no longer used. Each radio on a given system has a unique unit ID. The central controller tracks each fleet and subfleet (now called User group and Talk group respectively) a radio belongs to.

The central controller knows the User group and Talk group of each radio in a given system. The radio requesting a voice channel only transmits it's unit ID on the control channel to the central controller. If the controller does not know the User or Talk group of a particular radio, it directs the radio to transmit a dual word ISW. The dual word ISW contains the radio's Unit ID along with the User and Talk group that the radio wishes to use.

The operator can change the User and Talk group of the radio by changing the radio front panel switches. When the operator requests a voice channel, the radio automatically transmits a dual word ISW to the central controller. The central controller updates this data in memory.

Trunking Systems

Each radio system contains the following equipment:

- Central Controller
- Base Repeater Stations (as required)
- RF Control Stations (as required)
- Mobile Radio Units (as required)

Figure 1-1 illustrates a basic five channel centrally located system configuration in the area requiring radio coverage. For simplification, figure 1-1 shows three of the possible fleet/user groups. Each fleet/user group employs an RF control station and at least one group of radio-equipped vehicles.

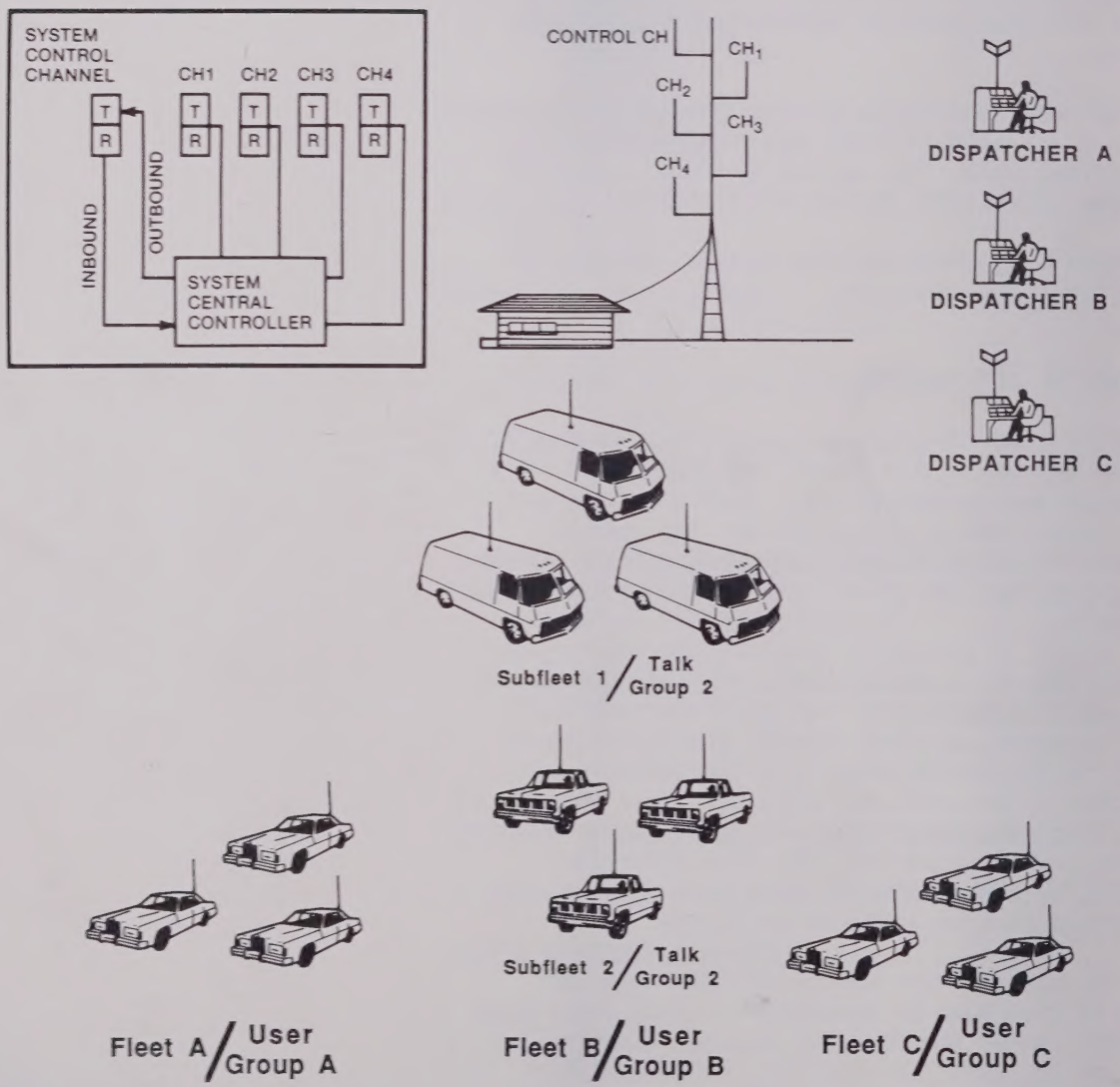


Figure 1-1
Five-channel system

Section 2
Trunking Option

The R-2001D is the newest model in a family of Communications System Analyzer products. The Trunked Radio Test Option is an enhancement of the R-2001D Communications System Analyzer. In addition to the capabilities of the basic R-2001D, the R-2021D has the capability to test Motorola trunked mobile and portable radios. It does this by simulating the central controller of a trunked radio system. Testing with the Trunked Radio Test Option involves call processing and direction to a voice channel where the general purpose RF test capabilities of the Communications System Analyzer test the radio performance. The radio test involves actual dynamic signaling conditions at any RF level. The trunked radio test option provides proof of basic inbound and outbound signaling and displays specification compliance data.

The R-2021D is compatible with Motorola trunking systems as shown below. Also shown are the frequencies the R-2021D is capable of generating and the duplex offset frequency required for each band.

mobile receive frequency band	duplex offset frequency
(806 Band) 851.0000 to 866.0000 MHz	+45 MHz
(896 Band) 935.0125 to 940.9875 MHz	+39 MHz
(JSMR Band) 850.0250 to 859.9750 MHz	−55 MHz
*(UHF Band) 403.000 to 430.000 MHz	± 0 to 10 MHz

Selection of the type of signaling is independent of the frequency band from Trunk I, Trunk I EP II, or Trunk II Signaling types.

*(Except UHF Trunking Band, which is fixed at Trunk II type.)

Note: The R-2021D is not signaling-compatible with non-Motorola Trunking systems.

The Trunked Radio Test Option, packaged within the R-2021D, has the following capabilities:

a) Dynamic Call Processing. Tests Motorola trunked mobile and portable radios under actual signaling conditions by simulating the function of the central controller. Provides separate screens for inbound (radio initiated) and outbound (controller initiated) calling modes.

b) Closed Cover Measurements. Measures and displays transmitter power, frequency error, and frequency deviation within the dynamic calling mode. While maintaining active signaling, make additional measurements on other screens. These tests provide the capability of closed cover testing, because performance of these tests uses the RF connection to the radio.

c) Radio ID Decoding. Within the dynamic calling mode, decoding and displaying of the fleet ID, subfleet ID, and unit ID for Trunk I signaling from the radio's transmitted ISW take place. For Trunk II signaling, the talk group and unit ID gets decoded and displayed.

d) Trunk Auto Test. The Trunk Auto test mode allows rapid testing of a predetermined number of channels on a radio. For each channel this test displays the ID information, transmitter power, frequency error, and frequency deviation. If desired, the R-2021D produces a printout of the test data and decoded ID information.

e) System Access Test. Special test screens provide simulation of a busy system and proof of mobile retry. This tests the radio's capability to function under heavily loaded system conditions.

f) Failsoft Test. The failsoft test simulates a failsoft condition by generating appropriate signaling on the failsoft channel.

g) Call Alert Test. Call Alert tests both inbound and outbound call alert with acknowledge verification. This verifies the radio's basic functioning in the call alert mode.

h) Private Call Test. In the Private Call test, the decoding of inbound private call signaling takes place and the R-2021D displays the called ID information and type of call. The Private Call Test verifies the basic functioning in the private call mode.

i) Phone Interconnect Test. This feature tests the inbound phone interconnect calling from the radio. The R-2021D decodes off-hook signaling and decodes and displays the DTMF outbound dialed digits. The R-2021D also has the capability to verify phone calls to the radio, the function of the DTMF keypad and the radio's phone interconnect request signaling.

j) Emergency Test. This feature tests the radio's ability to transmit an emergency ISW. The R-2021D decodes and displays the call type from the ISW.

k) Dynamic Regroup Test. This feature tests the radio's ability to transmit a dynamic regroup ISW. The R-2021D decodes and displays the call type from the ISW.

Section 3
Setup and General Information

This manual provides information and operating instructions for the R-2021D Communications System Analyzer's Radio Test Option. This manual assumes the operator is familiar with operation of the R-2001D and trunked radio systems. For information about a specific radio, consult the radio's service manual; for the R-2001D System Analyzer, consult the R-2001D Operator's Manual (part number 68-81069A66).

Along with setup instructions, the manual provides an overview of the trunking tests. If using Trunk I signaling, enter system information in the System Configuration screen before using the Trunked Radio Test Option. This manual explains the procedure and shows examples of entering system information in the System Configuration screen. Next, detailed instructions show how to use the different trunking tests. In addition, Appendix 2 lists error and warning messages. Appendix 3 shows the ISW call types. For the more experienced operator, a quick reference guide in Appendix 4 provides a summary of the different test modes.

Setup

Caution: When testing a radio, the R-2021D generates a control channel type of signal. Take care to prevent this from unintentionally capturing other radios in the area. Observe the following precautions:

1) Do not use an antenna on the R-2021D for over-the-air testing.

2) Use double-shielded cables on the R-2021D to carry signals to and from the radio.

3) Locate the R-2021D at least ten feet from the antenna of a unit that is working in the same system that the R-2021D is testing.

These precautions are especially important when performing such special tests as Emergency call.

Connecting a Radio

To connect the R-2021D to a radio, the following accessories are available in separate kits:

58-80313B37 RF Iso-T coupler
01-80352A02 BNC cable

Connect the RF In/Out port to the direct port of the Iso-T coupler, and connect the radio being tested to the other end of the direct port. Then connect the DUPLEX GEN port to the coupled port. Refer to figure 3-1. The 58-80345B09 coupler has a fixed 40 dB attenuation. For the variable RF coupler (58-80313B37), adjust the coupled port until it is between 1/4 and 1/2 inch back from the full-in position. Coupling tighter or looser than this can result in inaccurate measurements.

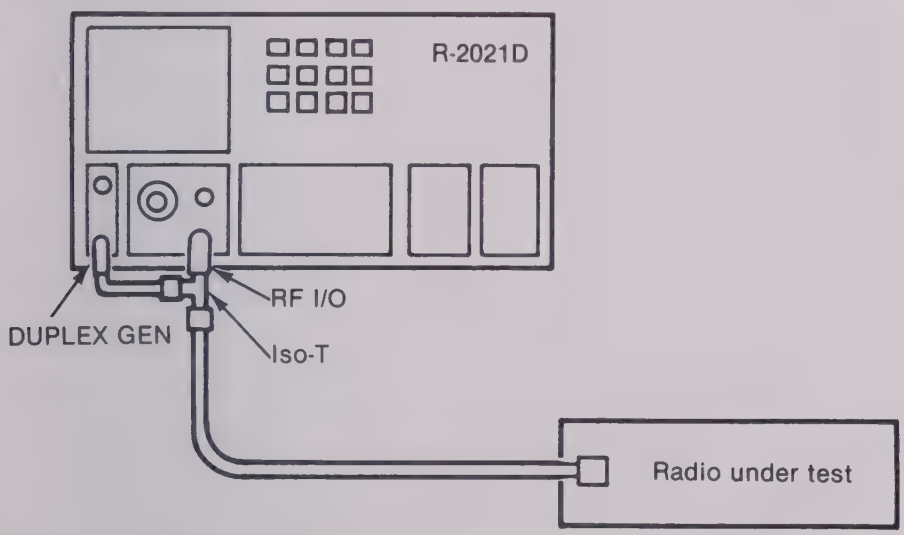


Figure 3-1
Connecting R-2021D to a radio

Connecting a Printer

On the side of the R-2021D is a 5-pin DIN type printer output connector. Use this connector to generate and receive RS-232 signals similar to those in a personal computer. When the proper connection and configuration exists between the R-2021D and printer, the printer can print the data displayed on the screen.

Many types of printers can be used with the R-2021D, including the following printers from Motorola:

RT-LX86/8148
RT-LX86/8148/220 (220 volt version)

The printer cable is a Motorola RTK-4081A. A serial printer cable for an Apple IIc* also works.

* Apple IIc is a registered trademark of Apple Computer Corp.

Printer Port Configuration

To set up the R-2021D for a specific RS-232 configuration, use special function 75 (SPFC 75). After selecting this special function, the R-2021D displays the Printer Init screen in figure 3-2. This screen shows the default values in the R-2021D that occur when executing a special function 79 (default reset). To change any of these values, move the cursor to the line to change and enter the number. The options for each of the selections are as follows:

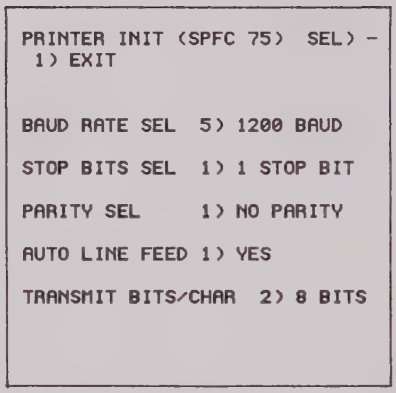

PRINTER INIT (SPFC 75) SEL) -
1) EXIT
BAUD RATE SEL 5) 1200 BAUD
STOP BITS SEL 1) 1 STOP BIT
PARITY SEL 1) NO PARITY
AUTO LINE FEED 1) YES
TRANSMIT BITS/CHAR 2) 8 BITS

Figure 3-2
Printer Init Screen

Baud Rate
1 75 baud
2 150 baud
3 300 baud
4 600 baud
5 1200 baud (default value)
6 2400 baud
7 4800 baud
8 9600 baud

Stop Bits
1 1 stop bit/character (default value)
2 1.5 stop bits/character
3 2 stop bits/character

Parity
1 no parity (default value)
2 even parity
3 odd parity

Auto Line Feed
1 on (default value)
2 off

Transmit bits
1 7 bits/character
2 8 bits/character (default value)

Nonvolatile memory retains any changes made to these values until the use of a special function 79 causes the values to reset back to the default values.

Printing the Screen

To print a screen, simultaneously press the 0 key and the left cursor key. The printer prints any characters displayed on the screen. If the display contains a bar graph, the printed "#" character shows the length of the bar. The R-2021D does not have the capability for printing waveforms.

While printing, the system locks and does not allow performance of any other operations. If the printer is off-line when the request for printing occurs, the screen displays a PRINTER BUSY message for 3 seconds (unless the display contains a waveform). If the character buffer of the R-2021D is full, a WAIT message appears for 3 seconds. When the printer accepts the output, the R-2021D beeps.

Trunking Tests: General Information

The R-2021D Trunking Option consists of three general tests: Radio Init test, Controller Init test, and Trunk Auto test. Another test option, Special Tests, accesses a menu that contains additional trunking tests. To end any of the trunking tests in progress, press 1.

Pretest Adjustments

Before using any of the general or special trunking tests, adjust and select the positions of the front panel switches on the R-2021D.

After starting the tests, if the positions of the front panel are incorrect, the R-2021D prompts the operator to correct the displayed switches.

Note: Since the R-2021D does not check the Image/Dplx switch, the operator must select the correct offset and sense before starting a test.

Thermometer Graphics

Some of the test screens have a thermometer style graphic. This thermometer shows the major signaling events within the calling process. Before a test begins, the operator may display help messages that correspond to the signaling event by moving the cursor across the numbers in the thermometer

graphic. The cursor moves right or left by pressing any number key, or the left cursor key respectively. As the test progresses, the number in the thermometer lights up and the R-2021D displays the corresponding help message to the right of the graphic.

Appendix 1 shows the thermometer graphics for the different signaling types.

Entering Information

Before beginning a test, enter the required information. For example, it may be necessary to enter the system ID, control channel frequency, and voice channel frequency. The R-2021D sometimes transfers the system ID and frequencies of the most recently entered or received data to the test screen. If the R-2021D performed a previous test, the test screen may display the system ID and channels of that test.

Enter the system ID as a four-digit hexadecimal number. Use the display keys on the front panel to enter digits A through F. Refer to figure 3-3 for more information. If the screen already displays a system ID and it requires a change, enter the new system ID over the old.

There are two ways to enter the control and voice channel frequencies: manually or by recalling a two-digit preset number from the RF memory table.

To recall a frequency, position the cursor at the two dashes after CC (control channel) or VC (voice channel) and enter the preset number from the RF memory table. To change the preset frequencies to correspond to those of the trunked system use the RF Memory display screen. All frequency entries must be the radio's receive frequencies. If the frequencies are not the radio's receive frequencies, the R-2021D shows an ERROR 03 after the start of the test.

To manually change the control channel (CC), voice channel (VC), duplex offset (OFFSET), and system ID (SYS ID), position the cursor and change the value before starting the test. The modification of the Duplex Offset occurs in 5 kHz steps from 0 through 10 MHz. Also, the duplex offset frequencies may be the discrete frequencies of 39, 45, and 55 MHz. To automatically set the discrete frequencies, select the most significant digit.

Help

If the operator selects the Help function, the R-2021D accesses information screens. Key 0 pages through the information screens, and Key 1 returns control of the system to the previous screen.

Temporary Exit

Some of the tests have a temporary exit option. The R-2021D displays this option at the top of the screen after the test begins. After selecting a temporary exit, the call is active while display keys select other displays for further testing. To return to a test after a temporary exit, use the Signaling Sequence display. The test is in the same state as before the temporary exit.

Note: Key the radio before going to the Spectrum Analyzer screen. The screen displays only the keyed radio's transmission. The radio cannot be dekeyed and rekeyed in the Spectrum Analyzer screen.

Exit

If the operator selects the Exit option, control of the program returns to the next higher level screen.

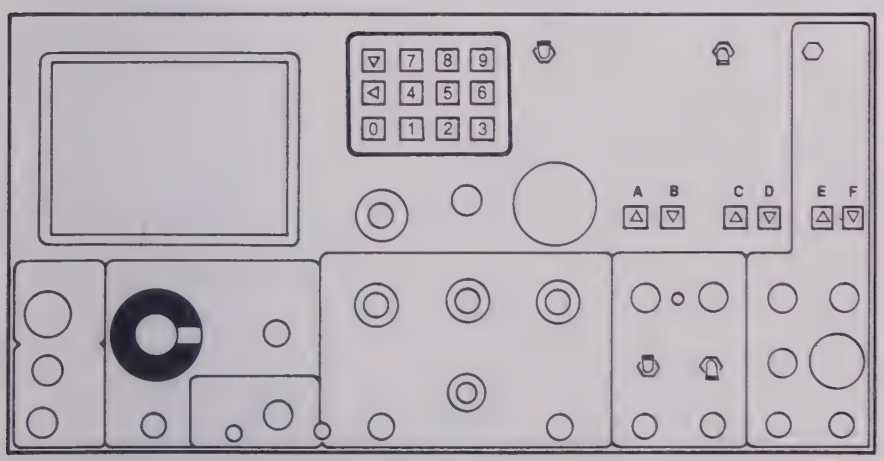


Figure 3-3
Display keys on the R-2021D

```
SIGNALING SEQUENCE MODE SEL) 0

 1) A/B ENCODE
 2) 5/6 TN ENCODE/DECODE
 3) SELECT V ENCODE/DECODE
 4) PL DECODE
 5) DPL DECODE
 6) GENERAL SEQ ENCODE/DECODE
 7) MOBILE TELEPHONE
 8) DTMF ENCODE/DECODE
 9) CABLE FAULT
10) TRUNKING
11) SECURE

MON/GEN SW FOR DECODE/ENCODE
```

Figure 3-4
Signaling Sequence Screen with Trunking and Secure Options.

```
SIGNALING SEQUENCE MODE SEL) -
ENTER 0 FOR MENU

 TRUNKING                SEL) -

0) HELP
1) RADIO INIT TEST
2) CONTROLLER INIT TEST
3) AUTO TEST
4) SPECIAL TEST MODE
5) SIGNALING TYPE
6) SYNTHESIZER CALIBRATION
7) CHANNEL PLAN  SELECT
8) SYSTEM CONFIGURATION

     **    TRUNK I     **
```

```
SIGNALING SEQUENCE MODE SEL) -
ENTER 0 FOR MENU

 TRUNKING                SEL) -

0) HELP
1) RADIO INIT TEST
2) CONTROLLER INIT TEST
3) AUTO TEST
4) SPECIAL TEST MODE
5) SIGNALING TYPE
6) SYNTHESIZER CALIBRATION
7) CHANNEL PLAN SELECT

    **   TRUNK II     **
```

Figure 3-5
Trunking Menu Screen

Reset

The R-2021D requires resetting before repeating some of the tests. When this is the case, at the end of the test the R-2021D displays a reset option at the top of the screen. To enter new data on the test screen, choose the reset option. When selected, the screen resets to its pre-test state (but retains the system ID, control channel frequency, and voice channel frequency). After resetting, the R-2021D can repeat the test on different voice channels or with different systems, fleets, or subfleets/talk groups.

Trunking Menu

Enter the Trunked Radio Test Option from the Signaling Sequence screen. Figure 3-4 shows the Signaling Sequence screen menu display. Select the number that corresponds with the Trunking Option. After the number selection, the R-2021D displays the Trunking Menu, shown in figure 3-5.

The Trunking Menu allows the operator to enter any of the trunking tests. Option 4, Special Test Mode, accesses a menu that contains special trunking tests. Nonvolatile memory (retains information during loss of input power) stores any data entered in any trunking screen.

Channel Plan Select

This is a new screen (figure 3-5A) which was not present in the original R2021D/0900. It has a dual purpose. It provides a selection for the 821-824 MHz Band Channel spacing. It also provides a new feature which allows selection of either a Hex or Decimal numeric form for the display of the radio ID information.

800 MHz Channel Plan Selections

The 12.5 KHz selection provides for proper signaling to all the new 12.5 KHz spaced channels in the 821-824 MHz U.S. public safety band.

The 25 KHz channel plan is a uniform extension of the 806 to 821 MHz band at 25 KHz channel spacing over the 821 to 825 MHz frequency range. This plan is used in various international applications.

Unit ID Display

The selection of either HEXIDECIMAL or DECIMAL on this screen sets the format for display of Radio ID information throughout the various test screens. The following table defines the number of digits displayed for Hexidecimal and Decimal format.

	Unit ID Hex	Unit ID DECIMAL	Talk Group HEX	Talk Group DECIMAL
Type I Signaling:	4	6	N/A	N/A
Type II Signaling:	4	6*	3	4
403-430 MHz Sig:	4	6*	3	4

Note: Fleet and Subfleet I.D.'s for Type I systems are always displayed in HEX.

*In Type II signaling and 403-430 MHz signaling, the most significant digit position of the 6 digit decimal ID field is used as a code to define different systems. Hence, the Unit ID is really made up of only 5 digits.

Trunking Option Menu Selection

Upon entry to the Trunking Option, the R-2021D displays the information in figure 3-5. This screen allows the operator to select the required signaling parameters and Trunking Tests. The last line on the screen shows the current signaling status of the system.

Note: Since Trunk II signaling does not require system configuration, the Trunking Menu screen does not allow access to it.

If the operator selects the Signaling Type Option (Key 5) from figure 3-5, the R-2021D allows a change to the type of radio signaling. Upon entry into the Signaling Type Option, the R-2021D displays figure 3-6. When the operator selects the desired signaling type, the R-2021D updates the screen and signaling type. EXIT returns the program to the Trunking Menu Screen.

```
SIGNALING SEQUENCE MODE SEL> -
ENTER 0 FOR MENU

 TRUNKING                SEL> -

0> HELP
1> RADIO INIT TEST
2> CONTROLLER INIT TEST
3> AUTO TEST
4> SPECIAL TEST MODE
5> SIGNALING TYPE
6> SYNTHESIZER CALIBRATION
7> CHANNEL PLAN SELECT
8> SYSTEM CONFIGURATION

        **   403-430 MHZ    **
```

Figure 3-5
Trunking Menu Screen
(Cont.)

```
CHANNEL PLAN SELECT      SEL> -
 0> HELP
 1> EXIT

800 MHZ CHANNEL PLAN     SEL> 1
 1> 821 MHZ 12.5 KHZ CH SPAC
 2> 821 MHZ 25.0 KHZ CH SPAC

UNIT ID DISPLAY          SEL> 1
 1> HEXIDECIMAL
 2> DECIMAL
```

Figure 3-5A
Channel Plan Select Screen

```
TRUNKING SIGNALING TYPE SEL> -
 0> HELP
 1> EXIT

SIGNALING TYPE
 1> TRUNK I
 2> TRUNK I  EP II
 3> TRUNK II
 4> 403-430 MHZ
```

Figure 3-6
Signaling Type Option Menu

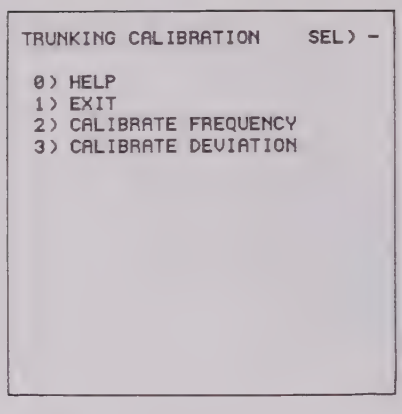


Figure 3-7
Trunking Option Synthesizer

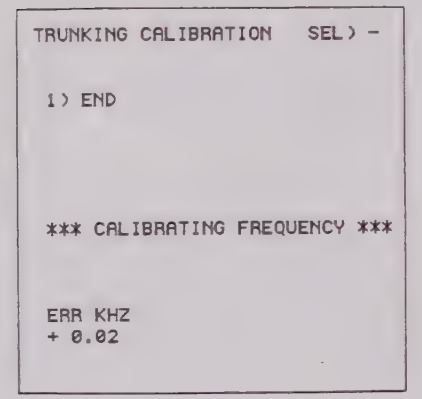


Figure 3-8
Trunking Option Synthesizer Frequency Calibration

If the operator selects the Trunk I option (Key 1) from the Signaling Type Option Menu, the program setting tests radios with Trunk I signaling and Normal Access (High Speed Handshake) time. The Trunking Test Menu Screen displays "TRUNK I" as the status.

If the operator selects the Trunk I EP II option (Key 2) from the Signaling Type Option Menu, the program setting tests radios with Trunk I signaling and Fast Access (No High Speed Handshake) time. The Trunking Menu Screen displays "TRUNK I EP II" as the status.

If the operator selects the Trunk II (Key 3) from the Signaling Type Option Menu, the program setting tests radios with Trunk II signaling and Fast Access (No High Speed Handshake) time. The Trunking Menu Screen displays "TRUNK II" as the status.

If the operator selects the 403-430 MHz option (Key 4) from the Signaling Type Option Menu, the program will allow access to the 403-430 MHz trunking test mode. UHF Trunking uses Type II signaling protocol with fast access, EP II as the standard format. The Trunking Screen displays "403-430 MHz" as the status.

If the operator selects SYNTHESIZER CALIBRATION (Key 6) from figure 3-5, the R-2021D accesses the screen in figure 3-7. This screen allows the operator to calibrate the frequency synthesizer circuit located on the Trunking Option Board. This is necessary to meet the frequency stability requirements for the bandwidth channels in the 896 MHz band.

The calibration routines calibrate the frequencies and modulation sensitivities used for the Trunking bands.

Calibration Procedure

1) Connect short BNC cable from duplex gen output to antenna port.
2) Set RF port select to antenna.
3) Set attenuation to 0 DB.
4) Set function switch to monitor.

Frequency Calibration

If the operator selects CALIBRATE FREQUENCY (Key 2) or CALIBRATE DEVIATION (Key 3) from the Trunking Option Synthesizer Frequency Calibration

screen, the R-2021D flashes a calibrating message on the screen. See figure 3-8. Stop the calibration process by pressing 1.

After calibration of the frequency synthesizer, the R-2021D flashes a CALIBRATION COMPLETE message on the screen and sounds an audio alarm. See figure 3-9.

If the R-2021D did not calibrate, a CAL NOT COMPLETED message flashes on the screen. See figure 3-10. This occurs if the R-2021D connections are not proper, or if the routine stops before completion of the calibration.

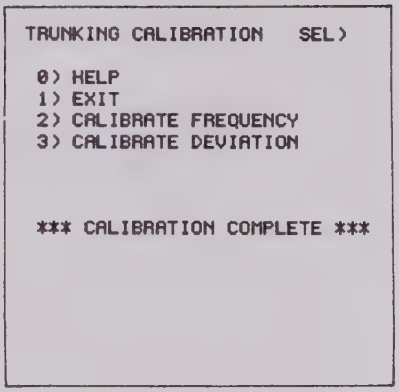


Figure 3-9
Trunking Option Synthesizer Frequency Calibration

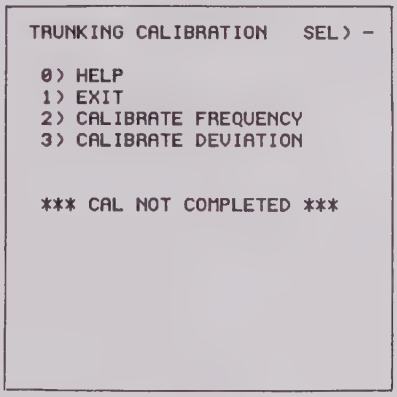


Figure 3-10
Trunking Option Synthesizer Frequency Calibration

System Configuration Option

Note: Use of this screen is dependent on the Signaling Type selected. For Trunk I (Type 1) signaling operation remains the same as described below.

Trunk II (Type II), other than UHF band does not require the system configuration screen.

403-430 MHz Signaling System Configuration

Upon selection of the System Configuration (Key 8) from figure 3-5, the Trunking Analyzer accesses the Trunking System Configuration screens. Figure 3-11 will be displayed if the system is set to operate in the 403-430 MHz band.

THIS DATA IS ESSENTIAL TO DEFINE THE CHANNEL NUMBER TO FREQUENCY RELATIONSHIP WHICH MAY BE UNIQUE TO EACH SYSTEM WITHIN THIS BAND. CALLS CANNOT BE COMPLETED WITHOUT CORRECT ENTRY OF THIS DATA.

THIS DATA SHOULD BE OBTAINED FROM THE SYSTEM MANAGER. IT ALSO SHOULD BE RESIDENT WITHIN EITHER THE MOTOROLA OR CUSTOMER MAINTAINED DATA BASE FOR EACH SYSTEM.

THE R-2021D DOES NOT ALLOW ACCESS TO THIS SCREEN IN TRUNK II SIGNALING.

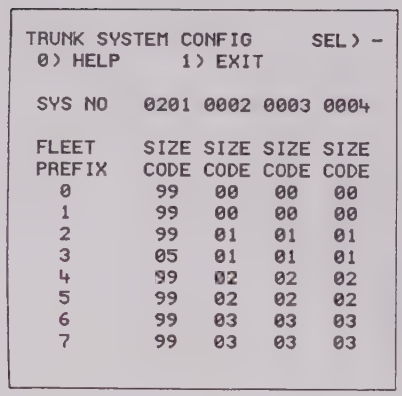


Figure 3-11
Trunk System Configuration Screen

If the operator selects the System Configuration Option (Key 7) from figure 3-5, the R-2021D accesses the Trunk System Configuration screen, figure 3-11. Enter the system configuration information before beginning a test to decode fleet, subfleet, and unit ID information in Trunk I signaling. Nonvolatile memory stores a maximum of four System configurations.

The system ID and size codes of the radio being tested make up a fleet map. The fleet map must be correct for the R-2021D to decode the ID information transmitted by the radio in its ISW.

The first entered item is the system ID. The radio being tested should have a user label that contains a 10-digit hexadecimal number. The first four numbers are the system ID, the next three the fleet ID, and the last three the radio's ID, (Unit ID).

For example, suppose the user label has the following hexadecimal number:

0A09400001

This represents:

System ID	Fleet ID	Individual ID
0A09	400	001
	↑ Fleet prefix	

Note: the fleet prefix is the first number of the three-digit fleet ID. Enter numbers using the keypad. Enter letters using the display keys on the front panel. Refer to figure 3-3.

Each trunking system configuration contains a set of eight size codes. A single letter designates each size code. Determine the system configuration information from the system manager for each system. This information is usually not listed on any of the labels on the radio. System configuration information is also in the Motorola Trunking Code Management System, in the second column of data within the Inquiry System Configuration, as shown in figure 3-12.

A number represents each size code letter because there are not enough keys on the R-2021D to enter all of the letters in the alphabet. Table 1 lists each size code letter and its corresponding number.

```
                          TRUNKING CODE MANAGEMENT SYSTEM      DATE
                                                               TIME
                            INQUIRY SYSTEM CONFIGURATION       NEXT
SYSTEM ID:  (NAME)
FLEET     SIZE     MAX        MAX            MAX        FLEETS  UNITS
PREFIX    CODE   FLEETS  UNITS/FLEET    SUBS/FLEEET   ASSGND  ASSGND
  0         A      127        016
  1         A      128        016
  2         B      016        064
  3         B      016        064
  4         C      008        128
  5         C      008        128
  6         D      001        512
  7         D      001        511
```

Figure 3-12
Inquiry System Configuration

Size Code Letter	Size Code Number	Size Code Letter	Size Code Number
A	00	J	09
B	01	K	10
C	02	L	11
D	03	M	12
E	04	N	13
F	05	O	14
G	06	P	15
H	07	Q	16
I	08	Z	99

TABLE 1
Size code letters and numbers

Enter the size codes below the System ID (SYS NO.) in the System Configuration screen. There is space to enter four systems, so the R-2021D tests radios on different systems without changing the System Configuration screen for each.

Warning: If the size codes are unavailable or incorrect, some tests run, but the decoded radio ID information obtained is not correct. The only way to detect this error is by checking the Radio Init screen. The 10-digit hexadecimal number from the user label should match the information in the Radio Init screen. ENTER THIS INFORMATION CORRECTLY.

There are two entries in the System Configuration screen: the 10-digit hexadecimal number from the user label (for the system ID) and the size codes for the system.

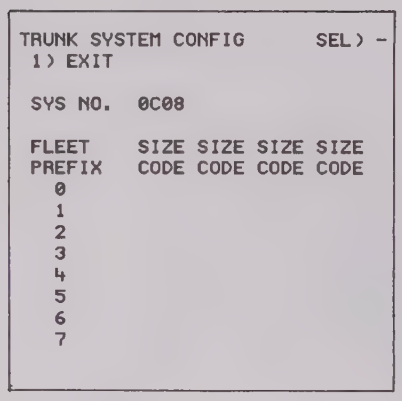


Figure 3-13
System Configuration Screen (system ID entered)

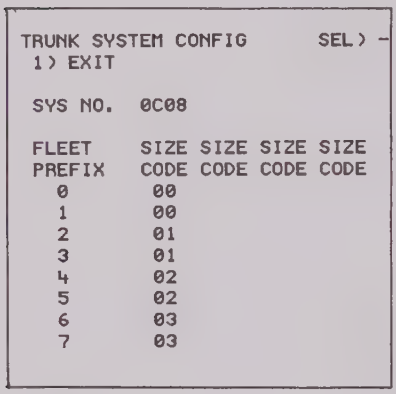


Figure 3-14
System Configuration Screen (size codes entered)

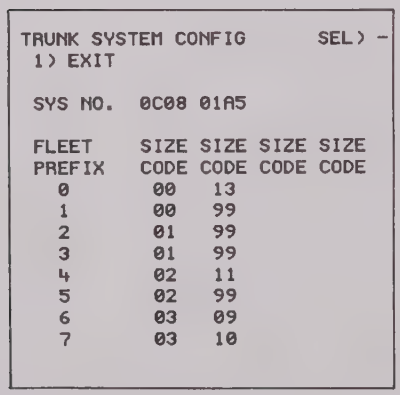


Figure 3-15
System Configuration Screen (second system ID and size codes entered)

Suppose the user label 10-digit hexadecimal number is:

0C08300001

Determine the system ID, fleet ID, fleet prefix, and individual ID this number.

System ID:	0C08
Fleet ID:	300
Fleet prefix:	3
Individual ID:	001

First, enter the system ID number to the right of SYS NO. See figure 3-13. If the system has size codes AABBCCDD, then use Table 1 to convert these size codes to:

A	00
A	00
B	01
B	01
C	02
C	02
D	03
D	03

Enter these numbers below their system ID. See figure 3-14.

As a second example of a fleet map (system ID and size codes), suppose the user label is:

01A54001A9

Also suppose the size codes are:

NZZZLZJK

From this information, the system ID is 01A5 and the size codes (from Table 1) are:

N	13
Z	99
Z	99
Z	99
L	11
Z	99
J	09
K	10

Enter this information in the System Configuration screen, as in figure 3-15.

Figure 3-16 shows the System Configuration screen after entering two additional systems. The hexadecimal numbers and size codes for these systems are:

0123000706 PZZZZZZZ

and

10FD23100C MZACOZZZ

In summary, to enter information in the System Configuration screen, first obtain the system ID from the 10-digit hexadecimal number on the user label. Then, determine the size code configuration of the system from the system manager. Convert the size codes using Table 1. In the System Configuration screen, enter the system ID, then the size code numbers below the system ID, and opposite the appropriate fleet prefix digits.

After entering the system ID and size code numbers, position the cursor at SEL in the System Configuration screen and press 1 to exit to the Trunking Menu.

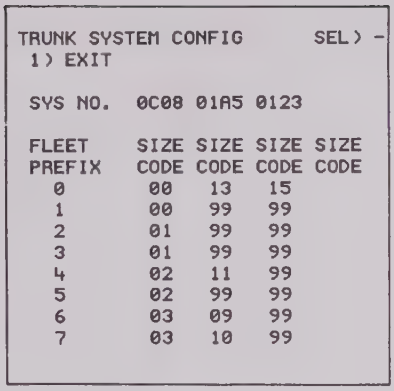


Figure 3-16
System Configuration Screen (third system ID and size codes entered)

System Configuration (403-430 MHz)

Use of this screen is dependent on the Signaling Type selected. For Trunk I (Type I) signaling, operation remains the same as described in the R2021D/0900 Operators manual.

Trunk II (Type II), other than UHF band, does not require the system configuration screen.

403-430 MHz Signaling System Configuration

Upon selection of the System Configuration (Key 8) from figure 3-5A, the Trunking Analyzer accesses the Trunking System Configuration screens. Figure 3-11A will be displayed if the system is set to operate in the 403-430 MHz band.

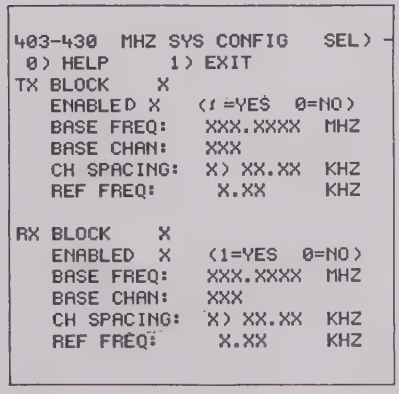

403-430 MHZ SYS CONFIG SEL) -
0) HELP 1) EXIT
TX BLOCK X
ENABLED X (1=YES 0=NO)
BASE FREQ: XXX.XXXX MHZ
BASE CHAN: XXX
CH SPACING: X) XX.XX KHZ
REF FREQ: X.XX KHZ
RX BLOCK X
ENABLED X (1=YES 0=NO)
BASE FREQ: XXX.XXXX MHZ
BASE CHAN: XXX
CH SPACING: X) XX.XX KHZ
REF FREQ: X.XX KHZ

Figure 3-11A
System Configuration Screen (403-430 MHz)

Note: TX refers to the Trunking Analyzers Generated Frequency which is the radio's receive frequency. RX refers to the radio's transmit frequency.

THIS DATA IS ESSENTIAL TO DEFINE THE CHANNEL NUMBER TO FREQUENCY RELATIONSHIP WHICH MAY BE UNIQUE TO EACH SYSTEM WITHIN THIS BAND. CALLS CANNOT BE COMPLETED WITHOUT CORRECT ENTRY OF THIS DATA.

THIS DATA MAY BE OBTAINED FROM THE SYSTEM MANAGER. IT EXISTS WITHIN THE CODE MANAGEMENT DATA BASE FOR EACH INDIVIDUAL SYSTEM WHICH RESIDES EITHER WITHIN MOTOROLA (TCMS) OR THE CUSTOMER'S LOCAL ASSIGNMENT SYSTEM.

The following defines each data item:

RX and TX BLOCKS:
Operating frequencies are organized into a maximum of three blocks numbered from 1 to 3. RX and TX blocks may be independent of each other.

BASE FREQ and BASE CHAN number:
Enter here the frequency in MHz and the channel number of the base channel for the particular block.

CH SPACING and REF FREQ:
These entries are made by entering a single code digit from 0 through F. The channel spacing and Reference Frequency will be displayed corresponding to the code digit entered via the following table.

Code	Chan Spac (KHz)	Ref Freq (KHz)	Code	Chan Spac (KHz)	Ref Freq (KHz)
0 →	5	5	8 →	25	5
1 →	6.25	6.25	9 →	31.25	6.25
2 →	10	5	A →	30	5
3 →	12.5	6.25	B →	37.5	6.25
4 →	15	5	C →	35,	5
5 →	18.75	6.25	D →	43.25	6.25
6 →	20	5	E →	40	5
7 →	25	6.25	F →	50	6.25

Digits A through F are entered by the dual function arrow keys to the right of the numeric keypad.

Section 4
Radio Init Test

The Radio Init Test function tests the radio's ability to access the system and to call another radio. The Radio Init Test function first tests the radio's signaling functions. After testing the radio's signaling functions, the R-2021D displays the RF transmitter power, frequency error, and frequency deviation information. This enables the operator to test the radio's RF functions.

The R-2021D shows the radio's code plug information, fleet ID and unit ID, to verify correct code plug programming for Trunk I signaling. If the operator selects Trunk II signaling, the R-2021D displays the radio's Unit ID and Talk group.

Pretest Adjustments

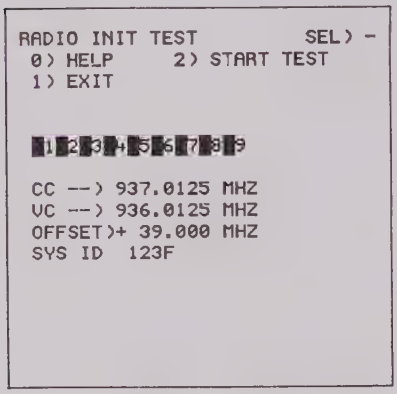
Before the test, make the following adjustments and selections to the switches on the front panel of the R-2021D:

DUPLEX GEN	On
RF Port Sel	RF In/Out
RF Step Attenuator	−50 dB Min*
Image/Dplx	**
BW	Narrow
Squelch	Off
DISPLAY	Signaling Seq
FUNCTION	Monitor-FM

*If a cable connects the radio to the R-2021D (refer back to figure 3-1) and the R-2021D's attenuation setting is 0 when the radio is keyed, an error may occur. If performing an over the air test or testing a radio that is transmitting very low power, decrease the attenuation setting -50 dB.

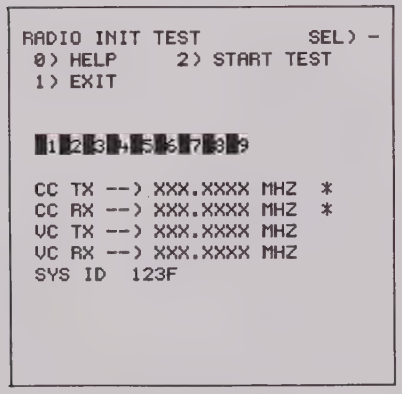
**The Image/Dplx switch position depends on the particular trunked system being tested.

TRUNK I SIGNALING



TRUNK II SIGNALING

- Thermometer graphic for Trunk I EP II will have seven indications. See Appendix 1


RADIO INIT TEST SEL) -
0) HELP 2) START TEST
1) EXIT
1 2 3 4 5 6 7 8 9
CC TX --) XXX.XXXX MHZ *
CC RX --) XXX.XXXX MHZ *
VC TX --) XXX.XXXX MHZ
VC RX --) XXX.XXXX MHZ
SYS ID 123F

RADIO INIT TEST
403-430 MHZ TRUNKING

*TX = RADIO'S RECEIVE FREQ
*RX = RADIO'S TRANSMIT FREQ

Figure 4-1
Radio Init Test Menu Screen

The Test Screen

If the operator selects the Radio Init Test (Key 1) from figure 3-5, The R-2021D displays the Radio Init Test menu, figure 4-1.

Figure 4-1
Radio Init Test Menu Screen

In the center of the screen, a thermometer-style graphic shows the major signaling events within the calling process. Appendix A provides a definition of the Radio Init test major signaling events for Trunk I, Trunk I EP II, and Trunk II signaling.

In the lower portion of the screen, enter:

control channel frequency
voice channel frequency
duplex offset frequency
system ID

With Trunk I signaling, the system ID must match one of the system IDs in the System Configuration screen in order to decode the radio's ID information.

With Trunk II signaling, the system ID must match the system ID of the radio being tested.

With 403-430 MHz trunking, the frequencies for the control channel transmit and receive must be entered along with the voice channel transmit and receive. Also, the operator must enter the system ID of the radio to be tested.

BEFORE EXECUTING A TEST, PROPER ENTRIES MUST BE MADE TO THE SYSTEM CONFIGURATION SCREEN FOR 403-430 MHz TRUNKING.

The Test

Begin the test by moving the cursor to the right of SEL and pressing 2. The R-2021D checks all data entered on the screen and, if everything is correct, the test starts. If there is a problem with the entered data, an error message appears. For a list of error and warning messages, refer to Appendix 2.

Note: In Trunk I signaling, this test runs if the operator entered a system ID that is not on the System Configuration screen, but the R-2021D does not decode or display the ID information. In this case the R-2021D displays the power, frequency error, frequency deviation, and connect tone. A WARNING 01 also occurs.

The R-2021D automatically enables the 20kHz lowpass and 5Hz highpass receive filters by selecting filter special functions 23 and 24. At the end of the test, the receive filters return to their pre-test states (even if the operator enters filter special functions 20 through 26 during a temporary exit).

After the test starts, the synthesizer on the R-2021D's trunking option board generates outbound idle patterns and system ID OSWs on the designated control channel through the DUPLEX GEN output. At this time, the R-2021D displays CC IDLE. The monitor receiver of the R-2021D is on the inbound control channel waiting for an ISW from the radio.

The R-2021D displays the Radio Init Test screen shown in figure 4-2. The R-2021D prompts the operator, with a flashing message and beeping alarm, to key the transmitter of the test radio.

Press the PTT switch to begin the call. When keyed up, the radio sends an ISW on the control channel frequency to show that it is calling. The R-2021D decodes the received ISW and displays the radio's fleet ID, subfleet ID, unit ID, and size code (unit ID and talk group if Trunk II signaling). The R-2021D uses alpha numeric characters to display the type of call made. Appendix 3 contains a description of the call types.

The R-2021D switches its receiver to the appointed voice channel while the control channel synthesizer continues with outbound signaling. The R-2021D sends a channel grant signaling word on the control channel frequency to tell the radio which voice channel to use. If the radio uses Trunk I signaling, it also sends a high speed acknowledge on the voice channel frequency to show that it received the high speed acknowledge. The R-2021D responds by sending an outbound connect word on the voice channel frequency.

```
RADIO INIT TEST          SEL) -
 1) END

 1 2 3 4 5 6 7 8 9 CC IDLE

 CC --) 865.5125 MHZ
 VC --) 864.5125 MHZ
 OFFSET)+ 45.000 MHZ
 SYS ID  0201    FLEET ID) ---
 UNIT ID) ---    SUBFL ID) --
 SIZE CODE) --   CON TN) --- HZ
 CALL TYPE) --
  *** KEY TRANSMITTER ***
```

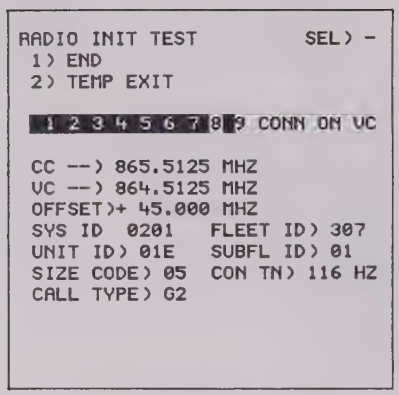
TRUNK I SIGNALING

```
RADIO INIT TEST          SEL) -
 1) END

 1 2 3 4 5 6 7 8 9 CC IDLE

 CC --) 937.0125 MHZ
 VC --) 936.0125 MHZ
 OFFSET)+ 39.000 MHZ
 SYS ID  123F
 UNIT ID) ---    TALK GRP) ---
 CALL TYPE) --   CON TN) --- HZ

  *** KEY TRANSMITTER ***
```

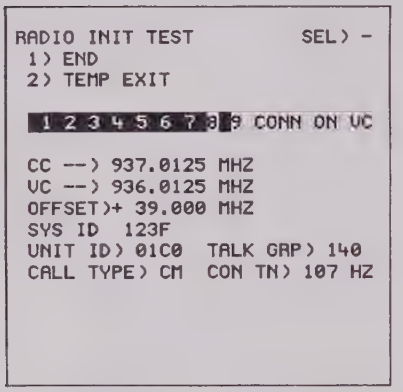
TRUNK II SIGNALING

- Thermometer graphic for Trunk I EP II will have seven indications. See Appendix 1

Figure 4-2
Radio Init Test


RADIO INIT TEST SEL) -
1) END
2) TEMP EXIT
1 2 3 4 5 6 7 8 9 CONN ON VC
CC --) 865.5125 MHZ
VC --) 864.5125 MHZ
OFFSET)+ 45.000 MHZ
SYS ID 0201 FLEET ID) 307
UNIT ID) 01E SUBFL ID) 01
SIZE CODE) 05 CON TN) 116 HZ
CALL TYPE) G2

TRUNK I SIGNALING


RADIO INIT TEST SEL) -
1) END
2) TEMP EXIT
1 2 3 4 5 6 7 8 9 CONN ON VC
CC --) 937.0125 MHZ
VC --) 936.0125 MHZ
OFFSET)+ 39.000 MHZ
SYS ID 123F
UNIT ID) 01C0 TALK GRP) 140
CALL TYPE) CM CON TN) 107 HZ

TRUNK II SIGNALING

- Thermometer graphic for Trunk I EP II will have seven indications. See Appendix 1

Figure 4-3
Radio Init Test:
Transmitter Keyed

Note: In testing radio's from hybrid systems, where one signaling type is actually employed while the radio ID information is mapped over to the other signalling type's ID format; The R-2021D will always display the ID information per the Signalling Type selected from the main menu. (EXAMPLE: If the radio is actually signalled with Type II, yet it's ID is defined in Type I terms, it must be tested as a Type II radio and the displayed ID information will be in Type II format). For such hybrid radio's verification of the mapped identity may be done via Radio Service Software testing or a manual conversion.

The thermometer display progresses rapidly through this signaling and stops after the CONN ON VC step. At this point, the radio has sent a connect tone on the voice channel frequency. The connect tone stays on the voice channel as long as the radio is keyed. In addition to the information already on the screen, the R-2021D calculates and displays the connect tone frequency. Refer to figure 4-3 for more information on the connect tone frequency.

Note: After the R-2021D displays the connect tone frequency, it remains the same for the rest of the test.

To complete the DISC RCVD test, unkey the radio to begin transmission of the disconnect signaling. When completed, the R-2021D has confirmed receipt of proper disconnect signaling from the radio. Then rekey the radio to measure frequency error (ERR KHZ), RF transmitter power (PWR W), and frequency deviation (DEV KHZ), as in figure 4-4.

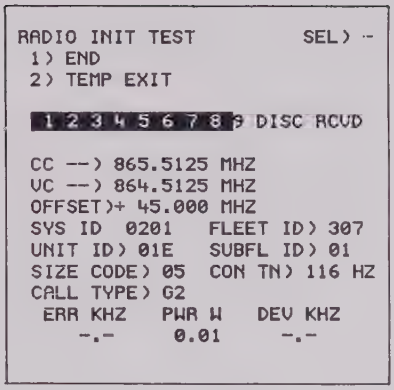
This R-2021D only displays the above data after the initial transmission test has progressed through the DISC RCVD step.

Connect signaling on the voice channel continues to hold the radio on the voice channel. At this point, audio modulation can be applied in one of three ways:

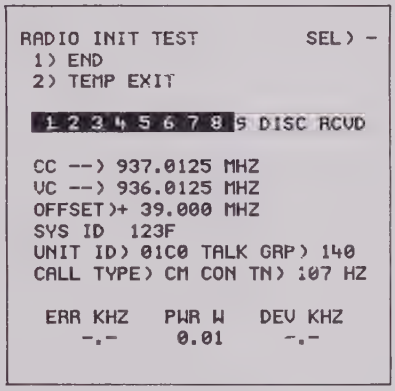
turn on the 1 kHz tone
connect a tone to the External Mod In jack
talk through the microphone of the radio

Note: If the radio drops off the voice channel for any reason during the test, the R-2021D directs it back to the voice channel when it returns to the control channel. The reason for the return is the R-2021D maintains active control channel signaling during voice channel operation (like the actual system).

To complete the last step and end the test, press 1. (Before ending the test, it is possible to enter other display screens in the R-2021D, but you must be in Signaling Sequence to end the test.)


RADIO INIT TEST SEL) -
1) END
2) TEMP EXIT
1 2 3 4 5 6 7 8 9 DISC RCVD
CC --) 865.5125 MHZ
VC --) 864.5125 MHZ
OFFSET)+ 45.000 MHZ
SYS ID 0201 FLEET ID) 307
UNIT ID) 01E SUBFL ID) 01
SIZE CODE) 05 CON TN) 116 HZ
CALL TYPE) G2
ERR KHZ PWR W DEV KHZ
-.- 0.01 -.-

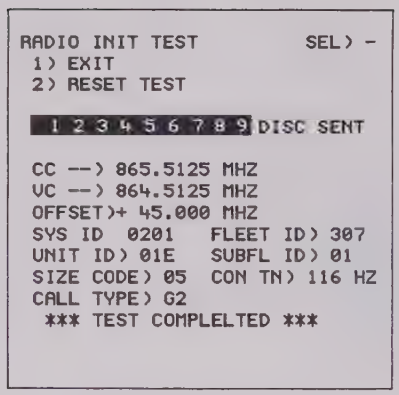
TRUNK I SIGNALING


RADIO INIT TEST SEL) -
1) END
2) TEMP EXIT
1 2 3 4 5 6 7 8 9 DISC RCVD
CC --) 937.0125 MHZ
VC --) 936.0125 MHZ
OFFSET)+ 39.000 MHZ
SYS ID 123F
UNIT ID) 01C0 TALK GRP) 140
CALL TYPE) CM CON TN) 107 HZ
ERR KHZ PWR W DEV KHZ
-.- 0.01 -.-

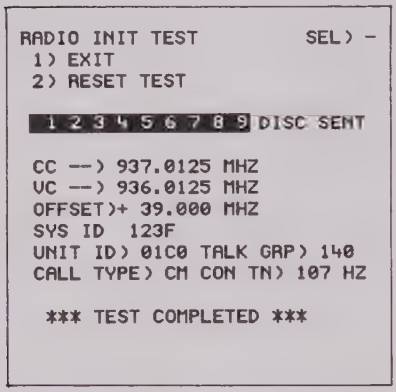
TRUNK II SIGNALING

- Thermometer graphic for Trunk I EP II will have seven indications. See Appendix 1

Figure 4-4
Radio Init Test:
Transmitter Unkeyed


RADIO INIT TEST SEL) -
1) EXIT
2) RESET TEST
1 2 3 4 5 6 7 8 9 DISC SENT
CC --) 865.5125 MHZ
VC --) 864.5125 MHZ
OFFSET)+ 45.000 MHZ
SYS ID 0201 FLEET ID) 307
UNIT ID) 01E SUBFL ID) 01
SIZE CODE) 05 CON TN) 116 HZ
CALL TYPE) G2
*** TEST COMPLELTED ***

TRUNK I SIGNALING


RADIO INIT TEST SEL) -
1) EXIT
2) RESET TEST
1 2 3 4 5 6 7 8 9 DISC SENT
CC --) 937.0125 MHZ
VC --) 936.0125 MHZ
OFFSET)+ 39.000 MHZ
SYS ID 123F
UNIT ID) 01C0 TALK GRP) 140
CALL TYPE) CM CON TN) 107 HZ
*** TEST COMPLETED ***

TRUNK II SIGNALING

- Thermometer graphic for Trunk I EP II will have seven indications. See Appendix 1

Figure 4-5
Radio Init Test:
End Test Initiated

The R-2021D sends a disconnect pattern on the voice channel frequency to return the radio to the control channel. The R-2021D displays the DISC SENT to the right of the thermometer and a TEST COMPLETED message at the bottom of the screen. See figure 4-5. At this point, press 1 to exit to the Trunking Menu screen or 2 to reset the test.

Problems

The following is a list of some of the typical problems that occur. Below the problems, is a list of possible causes and solutions (in addition to a radio malfunction).

- Radio does not receive the control channel.

  Recalibrate the trunking synthesizer.

  The control channel frequency entered in the R-2021D is not a valid control channel frequency for the radio.

- The R-2021D will not receive the ISW (step 2 on the thermometer won't light).

  The control channel entered is not a valid control channel for the radio.

  The duplex offset frequency entered is not valid for this radio.

  The system ID entered is not a valid system ID for the radio.

  Connections from the R-2021D to the radio are incorrect.

- Won't pass DISC RCVD step.

  The disconnect tone is not being sent and there is a problem with the radio. Measure the RF transmitter power, frequency error, and frequency deviation by executing a temporary exit and choosing the Gen/Mon display screen.

- ERROR 10 displayed continuously.

  If the radio connects to the R-2021D by a cable, check to see that RF attenuation setting is less than -50 dB.

- ERROR 11 is displayed continuously.

  The voice channel frequency is not a valid voice channel frequency for the radio. Check the radio setting to make sure it is set make a subfleet/ talk group call. The screen indicates the call type requested. See Appendix 3 for a list of call type descriptions.

- Incorrect information displayed.

  The System Configuration screen an incorrect size code (Trunk I signaling).

Advanced User's Notes

After completing the CONN ON VC step, it is possible to:

Do a temporary exit

Hear modulation (voice or transmission) from the radio on the R-2021D's speaker

Send modulation to the radio by turning on the 1 kHz tone, connecting a tone to the External Mod In jack, or by talking through the microphone

Measure power, frequency error, and frequency deviation
As an aid in troubleshooting system problems, enter FFFF for the system ID. This inhibits sending the system ID OSW on the control channel. In most radios, if a system ID OSW is not received within a time, the radio will not transmit an ISW.

To do the Radio Init Test with a system ID of FFFF, first turn the radio off. Then, start the Radio Init Test. The R-2021D outputs background OSWs on the control channel. Turn on the radio, wait at least 2 seconds (but not more than 8 seconds), and key the transmitter. Then proceed as in the Radio Init test. The R-2021D displays a WARNING 01 and does not decode or display any system ID information.

Section 5
Controller Init Test

The Controller Init Test

This function tests the radio's ability to receive a call. It tests the signaling ability of the radio, then power and sensitivity.

Pretest Adjustments

Before beginning the test, make the following adjustments and selections to the switches on the front panel of the R-2021D.

DUPLEX GEN	Off
RF Port Sel	RF In/Out
Image/Dplx	*
BW	Narrow
Squelch	Off
DISPLAY	Signaling Seq
FUNCTION	Generate-FM

*The Image/Dplx switch position depends on the particular trunked system being tested.

One difference between the Radio Init Test and the Controller Init Test is that in this test the R-2021D is in Generate mode.

The R-2021D generates on the control channel from the I/O port, rather than the DUPLEX GEN port. The RF step attenuator and fine adjust allow adjustment of the RF level of the voice channel going to the radio being tested. At very low signal levels (attenuator set greater than 90 dB), disconnect the DUPLEX GEN connection from the Iso-T coupler to increase the accuracy of this measurement.

The Test Screen

If the operator selects the Controller Init Test function (Key 2) from figure 3-5, the R-2021D displays the Controller Init menu screen, figure 5-1. Press 2 in the Trunking menu screen to enter the Controller Init Test screen.

In the center of the screen, a thermometer style graphic shows the major signaling events within the calling process. Appendix 1 defines the major signaling events for the Controller Init Test for Trunk I, Trunk I EP II, and Trunk II signaling.

In the Controller Init Test screen, enter the following:

control channel frequency
voice channel frequency
duplex offset frequency
system ID
fleet ID (Trunk I signaling)
subfleet ID (Trunk I signaling)
unit ID
talk group (Trunk II signaling)
call type

To call the test radio, all ID and frequency information on the screen must be correct. If the has already been tested, information from the previous test transfers to the Controller Init Test screen. Before beginning the Controller Init Test, make sure that the transferred information is correct for the desired selection on the radio.

In the CALL TYPE field, the R-2021D asks the operator to specify the type of call. For Trunk I signaling, enter 1 to begin a fleet call, or 2 to begin a subfleet call. For Trunk II signaling, enter 1 begin an announcement call, or 2 to begin a talk group call.

Note: For Announcement Call types, the talk group parameter setting should be the announcement talk group of the radio system. For Talk Group Call types, the talk group parameter setting should be the talk group corresponding to the radio mode.

Note: BEFORE EXECUTING A TEST, PROPER ENTRIES MUST BE MADE TO THE SYSTEM CONFIGURATION SCREEN FOR 403-430 MHz TRUNKING.

```
CONTROLLER INIT TEST   SEL) -
 0) HELP      2) START TEST
 1) EXIT

 [1][2][3][4][5]

 CC --) 865.5125 MHZ
 VC --) 864.5125 MHZ
 OFFSET)+ 45.000 MHZ
 SYS ID  0201   FLEET ID) 307
 UNIT ID) 01E   SUBFL ID) 01
 CALL TYPE 2) SUBFLEET
```

TRUNK I SIGNALING

```
CONTROLLER INIT TEST   SEL) -
 0) HELP       2) START TEST
 1) EXIT

 [1][2][3][4]

 CC --) 937.0125 MHZ
 VC --) 936.0125 MHZ
 OFFSET)+ 39.000 MHZ
 SYS ID  123F
 UNIT ID) 01C0  TALK GRP) 140
 CALL TYPE 1) ANNOUNCEMENT
```

TRUNK II SIGNALING

● Thermometer graphic for Trunk I EP II will have four indications. See Appendix 1

```
CONTROLLER INIT TEST     SEL) -
 0) HELP     2) START TEST
 1) EXIT

 [1][2][3][4]

 CC TX --) XXX.XXXX MHZ  *
 CC RX --) XXX.XXXX MHZ  *
 VC TX --) XXX.XXXX MHZ  *
 VC RX --) XXX.XXXX MHZ  *
 SYS ID)  XXXX
 UNIT ID)  XXXX TALK GRP) XXX
 CAL TYPE 1) ANNOUNCEMENT
```

* TX = RADIO'S RECEIVE FREQ
* RX = RADIO'S TRANSMIT FREQ

Figure 5-1
Controller Init Test Menu Screen

The Test

Position the cursor at the top of the Controller Init Test screen, by SEL, and press 2 to begin the test. The R-2021D checks all data entered on the screen and, if everything is correct, the test starts.

Note: During Trunk I signaling, if an entered system ID is not in the System Configuration screen, the R-2021D displays an ERROR 03 and the test ends. This differs from the Radio Init test, that under the same conditions, displays a warning and the test continues. See Appendix 2 for a list of error messages.

The R-2021D automatically enables the 20 kHz lowpass and 5 Hz highpass receive filters by selecting filter special functions 23 and 24. At the end of the test, the receive filters return to their pretest states (even if the operator enters filter special functions 20 through 26 during a temporary exit).

The R-2021D outputs a background pattern on the control channel frequency to lock the radio. After a few seconds, the R-2021D sends a channel grant signaling word on the control channel frequency to tell the radio which voice channel to use. Then the R-2021D sends a high speed acknowledge on the voice channel frequency. After the R-2021D sends outbound connect words on the voice channel frequency, the radio is on the voice channel. Key the transmitter to measure the radio's output power and test call back functioning. Refer to figure 5-2. The R-2021D can transmit modulation to the radio, but because the R-2021D is generating through the RF I/O port (Generate mode) it cannot receive any modulation from the radio.

Note: If the operator presses 2 to enter the subfleet/talk group in the CALL TYPE field, the R-2021D allows keying of the transmitter. The R-2021D does not allow keying of the transmitter if the operator presses 1 to enter fleet/announcement.

Complete the test by pressing 1 to end the call. By pressing 1, the R-2021D sends the radio a disconnect word on the voice channel frequency. The R-2021D displays a TEST COMPLETED message on

```
CONTROLLER INIT TEST      SEL) -
 1) END
 2) TEMP TEST

 1 2 3 4 5 OBD CONN

 CC --) 865.5125 MHZ
 VC --) 864.5125 MHZ
 OFFSET)+ 45.000 MHZ
 SYS ID  0201   FLEET ID) 307
 UNIT ID) 01E   SUBFL ID) 01
 CALL TYPE 2) SUBFLEET

            PWR W
             0.01
```

TRUNK I SIGNALING

```
CONTROLLER INIT TEST      SEL) -
 1) END
 2) TEMP TEST

 1 2 3 4 OBD CONN

 CC --) 937.0125 MHZ
 VC --) 936.0125 MHZ
 OFFSET)+ 39.000 MHZ
 SYS ID  123F
 UNIT ID) 01C0  TALK GRP) 140
 CALL TYPE 1) ANNOUNCEMENT

            PWR W
             0.01
```

TRUNK II SIGNALING

- Thermometer graphic for Trunk I EP II will have four indications. See Appendix 1

Figure 5-2
Controller Init Test

the bottom of the screen. See figure 5-3. At this point enter 1 to exit to the Trunking menu screen or enter 2 to reset the test.

Problems

The following list contains some typical problems (in addition to radio malfunction) that might occur. The list also contains some causes and solutions to the problems.

- The radio will not go to the voice channel.

  The control channel entered is not a valid control channel frequency for the radio.

  The voice channel frequency entered is not a valid voice channel frequency for the radio.

  The duplex offset frequency entered is not valid for this radio.

- The system ID entered is not a valid system ID for the radio.

  Connections from the R-2021D to the radio are incorrect.

  Size codes in the System Configuration screen are incorrect for this system (Trunk I signaling).

  RF attenuation setting is too high.

  The fleet ID, subfleet ID, unit ID, talk group, or call type is not correct.

- The radio will not key up, but the operator can hear the R-2021D modulation.

  A call issued was a fleet/announcement call (rather than a subfleet/talk group call).

Advanced User's Note

In the Controller Init Test, the R-2021D allows performance of a sensitivity test. There is a degradation from the published 12 dB SINAD sensitivity due to the transmitted connect word needed to keep the radio on the voice channel. To do the test, proceed as follows. After completion of the "OBD CONN" step on the thermometer, do a temporary exit to the Gen/Mon screen. Adjust the 1 kHz tone for the desired deviation (typically 3 kHz).

```
CONTROLLER INIT TEST   SEL) -
 1) EXIT
 2) RESET TEST

 1 2 3 4 5 DISC SENT

 CC --) 865.5125 MHZ
 VC --) 864.5125 MHZ
 OFFSET)+ 45.000 MHZ
 SYS ID  0201   FLEET ID) 307
 UNIT ID) 01E   SUBFL ID) 01
 CALL TYPE 2) SUBFLEET

   *** TEST COMPLETED ***
```

TRUNK I SIGNALING

```
CONTROLLER INIT TEST   SEL) -
 1) EXIT
 2) TEMP EXIT

 1 2 3 4 DISC SENT

 CC --) 937.0125 MHZ
 VC --) 936.0125 MHZ
 OFFSET)+ 39.000 MHZ
 SYS ID  123F
 UNIT ID) 01C0  TALK GRP) 140
 CALL TYPE 1) ANNOUNCEMENT

   *** TEST COMPLETED ***
```

TRUNK II SIGNALING

Figure 5-3
Controller Test Sequence: End Test Initiated

Next, connect the radio's received audio to the DVM scope jack on the R-2021D's front panel. Decrease the step attenuator and variable controls to obtain the desired SINAD, and read the output signal level from the lower portion of the Gen/Mon screen.

Section 6
Trunk Auto Test

The Trunk Auto Test tests the radio's ability to call another radio over several voice channels without entering a new voice channel every time. The R-2021D also allows the operator to obtain a printout of the test results for each voice channel.

This automated mode of testing provides a way to test a radio on a pre-determined set of channels. One use of the Trunk Auto option is testing a radio that has a reliability problem.

Pretest Adjustments

Before the test, make the following adjustments and selections to the switches on the front panel of the R-2021D.

DUPLEX GEN	On
RF Port Sel	RF In/Out
RF Step Attenuator	−50 dB Min*
Image/Dplx	**
BW	Narrow
Squelch	Off
DISPLAY	Signaling Seq
FUNCTION	Monitor-FM

*If a cable connects the radio to the R-2021D (refer to figure 3-1), and the attenuation setting of the R-2021D is 0 when testing a keyed radio, an error may occur. If performing an over the air test or testing a radio that is transmitting very low power, decrease the attenuation from −50 dB.

**The Image/Dplx switch position depends on the particular trunked system being tested.

```
TRUNK AUTO TEST          SEL) -
 0) HELP      2) START TEST
 1) EXIT
CHANNEL SELECTION        SEL) 1
 1) FREQUENCY TABLE
 2) VARIABLE STEP
 CC --) 865.5125 MHZ
 VC --) 864.5125 MHZ
 VC --) 863.5125 MHZ
 VC --) 862.5125 MHZ
 VC --) 861.5125 MHZ
 OFFSET)+ 45.000 MHZ
 SYS ID) 0201
 AUTO KEY (YES=1,NO=0) 0
 PRINTER (YES=1,NO=0) 0
```

Figure 6-1
Trunk Auto Test Menu Screen
Frequency Table Mode

```
TRUNK AUTO TEST       SEL) -
 0) HELP 1) EXIT 2)START TEST

 CC TX --) XXX.XXXX MHZ *
    RX --) XXX.XXXX MHZ *
 VC TX --) XXX.XXXX MHZ *
    RX --) XXX.XXXX MHZ *
 VC TX --) XXX.XXXX MHZ *
    RX --) XXX.XXXX MHZ *
 VC TX --) XXX.XXXX MHZ *
    RX --) XXX.XXXX MHZ *
 SYS ID) XXXX
 AUTO KEY (YES=1,NO=0) 0
 PRINTER (YES=1,NO=0) 0

* TX = RADIO'S RECEIVE FREQ
* RX = RADIO'S TRANSMIT FREQ
```

Figure 6-1A
Trunk Auto Test Menu Screen
403-430 MHz Trunking

```
TRUNK AUTO TEST          SEL) -
 0) HELP      2) START TEST
 1) EXIT
CHANNEL SELECTION        SEL) 2
 1) FREQUENCY TABLE
 2) VARIABLE STEP

CC --)  865.5125 MHZ
START VC --) 860.0000 MHZ
OFFSET)+ 45.000 MHZ
SKIP FACTOR)  001
SYS ID  0201

AUTO KEY (YES=1,NO=0) 0
PRINTER (YES=1,NO=0) 0
```

Figure 6-2
Trunk Auto Test Menu Screen
Variable Step Mode

The Test Screen

If the operator selects the Trunking Automatic Test function (Key 3) from figure 3-5, the R-2021D accesses the Trunk Auto Test function.

The test frequencies can be chosen in two ways: the Frequency Table mode, or the Variable Step mode. The screen displays either figure 6-1, (Frequency Table Mode), or figure 6-2, (Variable Step Mode), depending on last Trunk Auto Test function performed.

Frequency Table Mode

To choose the Frequency Table mode, position the cursor in the middle of the Trunk Auto Test screen, by CHANNEL SELECTION SEL, and press 1. The frequency table consists of one control channel and four voice channels, as shown in figure 6-1. The operator can test all channels in a five-channel system, or test the radio at specific frequencies across the band.

Note: The operator can only test non-synthesized radios at specific voice channel frequencies. These frequencies are listed on the radio.

In the Frequency Table mode of the Trunk Auto Test, enter the following information:

control channel frequency
four voice channel frequencies
duplex offset frequency
system ID
printer function
auto key function

For the printer function, choose 1 to obtain a printout of the results.

For the auto key function, select 1 if the system configuration automatically keys the radio.

Variable Step Mode

Use the Variable Step mode as a second way to select test frequencies. To choose this mode, position the cursor in the middle of the Trunk Auto Test

screen, by CHANNEL SEL, and press 2. See figure 6-2. In the Variable Step mode the operator can check more than four frequencies of a sample of frequencies.

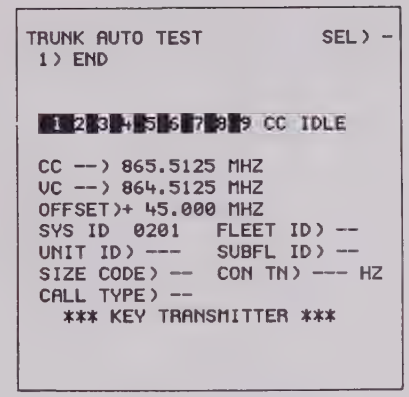
An entered skip (or step) factor (for subsequent voice channels) shows the number of channels the Trunk Auto Test should skip to get to the next voice channel test frequency. For example, with a skip factor of 100, the test starts at the entered voice channel and progresses through the band in uniform steps of 100 channels each. This simplifies entry when specific voice channel frequencies are not critical or when a testing requires many voice channel tests.

In the Variable Step mode, enter:

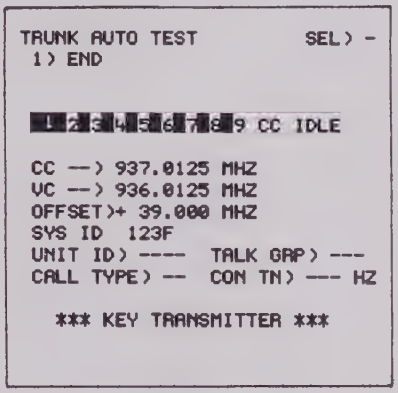
control channel frequency
starting voice channel frequency
duplex offset frequency
skip factor
system ID
printer function
auto key

For the printer function, choose 1 to obtain a printout of the results.

For the auto key function, select 1 if the system configuration automatically keys the radio.


TRUNK AUTO TEST SEL) -
1) END
1 2 3 4 5 6 7 8 9 CC IDLE
CC --) 865.5125 MHZ
VC --) 864.5125 MHZ
OFFSET)+ 45.000 MHZ
SYS ID 0201 FLEET ID) --
UNIT ID) --- SUBFL ID) --
SIZE CODE) -- CON TN) --- HZ
CALL TYPE) --
*** KEY TRANSMITTER ***

TRUNK I SIGNALING


TRUNK AUTO TEST SEL) -
1) END
1 2 3 4 5 6 7 8 9 CC IDLE
CC --) 937.0125 MHZ
VC --) 936.0125 MHZ
OFFSET)+ 39.000 MHZ
SYS ID 123F
UNIT ID) ---- TALK GRP) ---
CALL TYPE) -- CON TN) --- HZ
*** KEY TRANSMITTER ***

TRUNK II SIGNALING

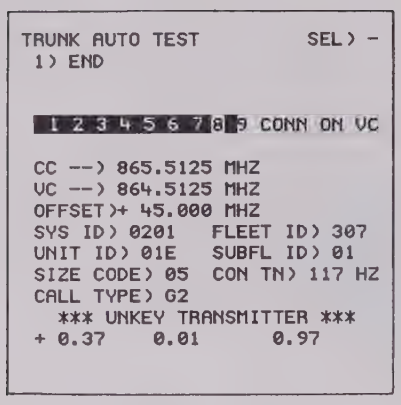
Figure 6-3
Trunk Auto Test

The Test

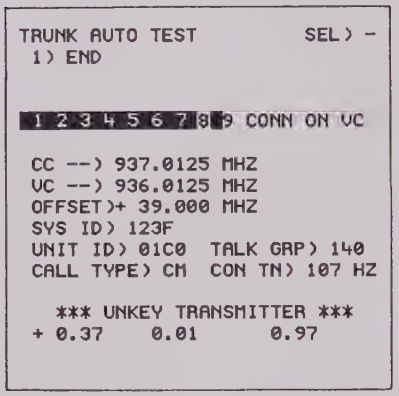
After selecting the Frequency Table or Variable Step mode, enter 2 at the top of the Trunk Auto Test screen to start the test. See figure 6-3. For both modes, the screen is like the Radio Init Test screen, except there is no temporary exit function.

In the center of the screen, a thermometer-style graphic shows the major signaling events within the calling process. Appendix 1 defines the major signaling events for Trunk I, Trunk I EP II, and Trunk II signaling.

The Trunk Auto Test sequence consists of a series of Radio Init Tests automatically performed on a number of voice channel frequencies. The R-2021D executes the sequence until; completion of testing on all four voice channels in the Frequency Table Mode, it detects an error, or the operator terminates the test. In the Variable Step mode, the R-2021D executes the sequence until; it detects an error, the operator ends execution, or the program


TRUNK AUTO TEST SEL) -
1) END
1 2 3 4 5 6 7 8 9 CONN ON VC
CC --) 865.5125 MHZ
VC --) 864.5125 MHZ
OFFSET)+ 45.000 MHZ
SYS ID) 0201 FLEET ID) 307
UNIT ID) 01E SUBFL ID) 01
SIZE CODE) 05 CON TN) 117 HZ
CALL TYPE) G2
*** UNKEY TRANSMITTER ***
+ 0.37 0.01 0.97

TRUNK I SIGNALING


TRUNK AUTO TEST SEL) -
1) END
1 2 3 4 5 6 7 8 9 CONN ON VC
CC --) 937.0125 MHZ
VC --) 936.0125 MHZ
OFFSET)+ 39.000 MHZ
SYS ID) 123F
UNIT ID) 01C0 TALK GRP) 140
CALL TYPE) CM CON TN) 107 HZ
*** UNKEY TRANSMITTER ***
+ 0.37 0.01 0.97

TRUNK II SIGNALING

Figure 6-4
Trunk Auto Test Sequence: Transmitter Keyed

has checked all the frequencies in the frequency band. The R-2021D displays the Trunk Auto Test sequence screen, figure 6-3.

A flashing message and beeping alarm prompt the operator to key the transmitter of the test radio.

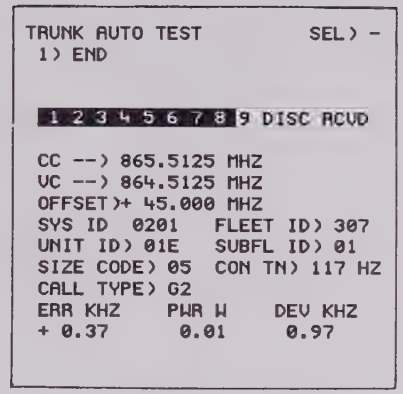
If the radio is not keyed before the unkey prompt, measurements will not be accurate. See figure 6-4. The R-2021D can automatically key the radio if a suitable customer supplied cable (using mating connector RPX-4635A) connects it to the radio. Connect the cable to the Trunking I/O connector on the side of the R-2021D. The relay closure between pins 1 and 2 connects across the radio key-line. (Note: These contacts allow the use of customer cables. Motorola does not supply these cables. Compatibility between the contact closure and the requirements of any radio model is not assumed.)

The R-2021D decodes and displays received data for each channel. The R-2021D also displays the RF transmitter power, frequency error, and frequency deviation. See figure 6-5. After viewing the results displayed for one voice channel, keep the radio keyed to review the screen. When the radio is dekeyed, the next sequence begins.

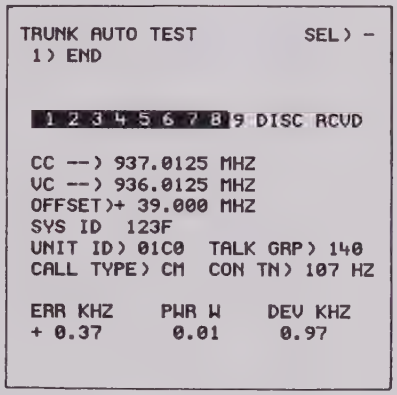
The operator can obtain a channel-by-channel printout by selecting the printer function (be sure to connect the external printer and turn it on). The R-2021D prints the first screen in its entirety. The printer prints only the voice channel frequency, subfleet ID/talk group, frequency error, power, and frequency deviation in subsequent screens.

If the operator selects the printer and a testing error (ERROR 10 through ERROR 29) occurs, the printer prints the error and the test progresses to the next frequency. If a setup error (ERROR 1 through ERROR 9) occurs, correct the error and restart the test. If the operator does not select the printer, and a testing error occurs, the R-2021D stops the test. Continue the Trunk Auto Test at the next voice channel or end the test.

In the Frequency Table mode, the test ends after completion of testing on all four voice channels. In the Variable Step mode, the test ends when the frequency equals (or exceeds) the highest allowable voice channel frequency for the trunked system being tested.


TRUNK AUTO TEST SEL) -
1) END
1 2 3 4 5 6 7 8 9 DISC RCVD
CC --) 865.5125 MHZ
VC --) 864.5125 MHZ
OFFSET)+ 45.000 MHZ
SYS ID 0201 FLEET ID) 307
UNIT ID) 01E SUBFL ID) 01
SIZE CODE) 05 CON TN) 117 HZ
CALL TYPE) G2
ERR KHZ PWR W DEV KHZ
+ 0.37 0.01 0.97

TRUNK I SIGNALING

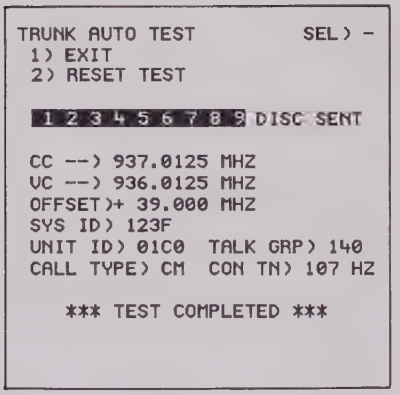

TRUNK AUTO TEST SEL) -
1) END
1 2 3 4 5 6 7 8 9 DISC RCVD
CC --) 937.0125 MHZ
VC --) 936.0125 MHZ
OFFSET)+ 39.000 MHZ
SYS ID 123F
UNIT ID) 01C0 TALK GRP) 140
CALL TYPE) CM CON TN) 107 HZ
ERR KHZ PWR W DEV KHZ
+ 0.37 0.01 0.97

TRUNK II SIGNALING

Figure 6-5
Trunk Auto Test:
Transmitter Unkeyed

TRUNK AUTO TEST SEL) -
1) EXIT
2) RESET TEST
1 2 3 4 5 6 7 8 9 DISC SENT
CC --) 865.5125 MHZ
VC --) 864.5125 MHZ
OFFSET)+ 45.000 MHZ
SYS ID) 0201 FLEET ID) 307
UNIT ID) 01E SUBFL ID) 01
SIZE CODE) 05 CON TN) 117 HZ
CALL TYPE) G2
*** TEST COMPLETED ***

TRUNK I SIGNALING


TRUNK AUTO TEST SEL) -
1) EXIT
2) RESET TEST
1 2 3 4 5 6 7 8 9 DISC SENT
CC --) 937.0125 MHZ
VC --) 936.0125 MHZ
OFFSET)+ 39.000 MHZ
SYS ID) 123F
UNIT ID) 01C0 TALK GRP) 140
CALL TYPE) CM CON TN) 107 HZ
*** TEST COMPLETED ***

TRUNK II SIGNALING

Figure 6-6
Trunk Auto Test: End

See figure 6-6. If the test stops, the R-2021D displays TEST COMPLETED.

If the operator selected the print function, the printer prints following summary at the end of the test:

total number of errors
total number of warnings
minimum and maximum power
minimum and maximum frequency deviation
maximum frequency error

When the test ends, press 1 to exit and return to the Trunking menu, or 2 to reset the test. If desired, repeat the Trunk Auto Test on different voice channels or with different systems, fleets, or subfleets/talk groups.

Problems

Refer to the problems listed for Radio Init Test for a list of some typical problems and possible solutions.

Advanced User's Note

If running Trunk Auto Test in a semi-automated mode (manually keying and unkeying the radio), the operator can change the subfleet/talk group selector on the radio to check the operation of all subfleets/ talk groups. The printer will print the subfleet/talk group.

Section 7
Special Tests

The Special Test mode tests features of trunking radios other than radio or controller init. Section 2 discusses the features shown in figure 7-1.

In the Special Tests that require a system ID, the operator must enter a system ID that is in the System Configuration screen (Trunk I signaling). The operator cannot enter FFFF as the system ID. If the operator enters a system ID that is not in the System Configuration screen, the R-2021D displays an ERROR 03 and the test ends. See Appendix 2 for a list of error and warning messages. In Trunk II signaling, the system ID must match the system ID of the radio under test.

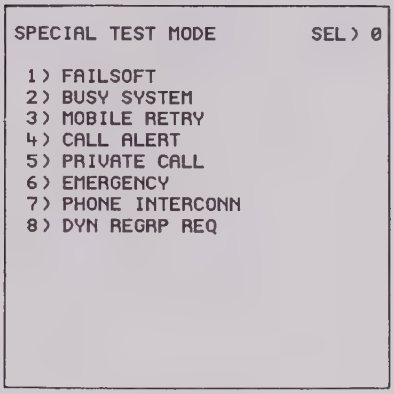


Figure 7-1
Special Test Mode Menu

Special Test Menu

If the operator selects the Special Test function (Key 4) from figure 3-5, the R-2021D accesses the Special Test functions. If this is the first time the operator has called the Special Test mode, the R-2021D displays the Special Test menu in figure 7-1. Otherwise, the R-2021D displays the screen containing the most recently used Special Test.

Note: To exit the Special Test menu, access one of the Special Test screens and exit through that test screen.

All of the individual test menu screens will have the same menu selections as diagramed in the top portion of figure 7-2.

If the operator selects the menu function (Key 0) from the individual test menu screen, control of the R-2021D will return to the Special Test mode menu screen, figure 7-1.

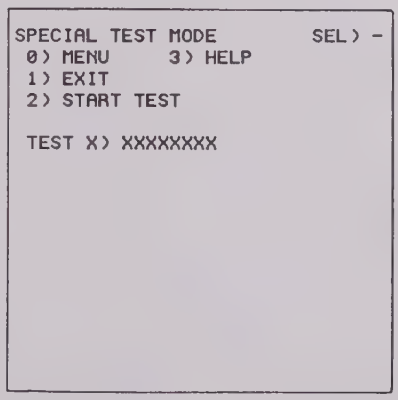


Figure 7-2
Individual Special Test Menu Screen

```
SPECIAL TEST MODE          SEL> -
 0> MENU      3> HELP
 1> EXIT
 2> START TEST

 TEST 1> FAILSOFT



FAILSOFT CHAN --> 865.0125 MHZ
```

```
SPECIAL TEST MODE          SEL> -
 0> MENU      3> HELP
 1> EXIT
 2> START TEST

 TEST 1> FAILSOFT

FAILSOFT CHAN
 FS TX --> XXX.XXXX MHZ *
 FS RX --> XXX.XXXX MHZ *
```

403-430 MHZ TRUNKING

* TX = RADIO'S RECEIVE FREQ
* RX = RADIO'S TRANSMIT FREQ

Figure 7-3
Failsoft Test Menu Screen

```
SPECIAL TEST MODE          SEL> -
 1> END
 2> TEMP EXIT

 TEST 1> FAILSOFT



FAILSOFT CHAN --> 866.0125 MHZ

** FAILSOFT CHANNEL ACTIVE **
```

Figure 7-4
Failsoft Test Screen

Failsoft Test

In the Failsoft Test, the R-2021D simulates an inoperative central controller. The R-2021D simulates an inoperative controller by not transmitting Outbound Signaling Words (OSW's) on the control channel, and outputting the failsoft word on the failsoft channel (system voice channel).

When the central controller is inoperative, the radio automatically switches to its preassigned failsoft channel, and conventional repeater operation is possible. After the radio is on the failsoft channel, the operator can send modulation in both directions as in the Radio Init Test. Temporary exit is available anytime after the test starts.

The Test Screen

If the operator selects the Failsoft Test (Key 1) from the Special Test mode menu screen, figure 7-1, the R-2021D displays the Failsoft Test menu screen in figure 7-3.

If the R-2021D is in one of the other Special Test menu screens, the R-2021D allows the operator to select the Failsoft Test by moving the cursor to the center of the screen by the word TEST, and pressing 1.

The only item to enter is the failsoft channel frequency. Enter this frequency at the bottom of the screen by FAILSOFT CHAN.

The Test

If the operator selects the Start Test function (Key 2) from the Failsoft Test menu screen, the R-2021D executes the Failsoft Test and displays a Failsoft Test screen similar to figure 7-4.

If there is a problem with the entered data, the R-2021D displays an error message. If no problem exists, the message FAILSOFT CHANNEL ACTIVE appears at the bottom of the screen, as in figure 7-4. This message shows the failsoft word is being output on the failsoft channel.

After the radio has locked onto the failsoft channel, the operator can transmit modulation from the R-2021D to the radio. The operator accomplishes this by turning on the 1kHz tone, connecting a tone

to the External Mod In jack, or talking through the R-2021D's microphone. It is also possible to transmit from the radio to the R-2021D. To end the test, press 1. The R-2021D displays a TEST ENDED message.

Busy System Test

Busy occurs when all voice channels on a system are being used. The central controller transmits a busy signal on the control channel to the radio. The radio shows that it has received the busy signal by emitting a busy tone similar to a telephone busy tone. During the Busy System Test, the R-2021D simulates the central controller and transmits a busy signal to the radio when it receives an Incoming Signaling Word (ISW) from the radio. When the operator requests a callback, the R-2021D and the radio complete the call.

The Test Screen

If the operator selects the Busy System (Key 2) from the Special Test mode menu screen, figure 7-1, the R-2021D displays the Busy System Test menu screen in figure 7-5.

If the R-2021D is in one of the other Special Test menu screens, the operator can select the Busy System Test by moving the cursor to the center of the screen by the word TEST, and pressing 2.

In the center of the screen, a thermometer-style graphic shows the major signaling events within the calling process. These signaling events are the same as in the Radio Init Test, except the R-2021D does not display the radio's ID information. Enter the following information:

control channel frequency
voice channel frequency
duplex offset frequency
system ID

```
SPECIAL TEST MODE        SEL) -
 0) MENU      3) HELP
 1) EXIT
 2) START TEST

 TEST 2) BUSY SYSTEM


 1 2 3 4 5 6 7 8 9
 CC --) 865.5125 MHZ
 VC --) 864.5125 MHZ
 OFFSET)+ 45.000 MHZ
 SYS ID) 0201
```

TRUNK I SIGNALING

```
SPECIAL TEST MODE        SEL) -
 0) MENU      3) HELP
 1) EXIT
 2) START TEST

 TEST 2) BUSY SYSTEM


 1 2 3 4 5 6 7 8 9
 CC --) 937.0125 MHZ
 VC --) 936.0125 MHZ
 OFFSET)+ 39.000 MHZ
 SYS ID) 123F
```

TRUNK II SIGNALING

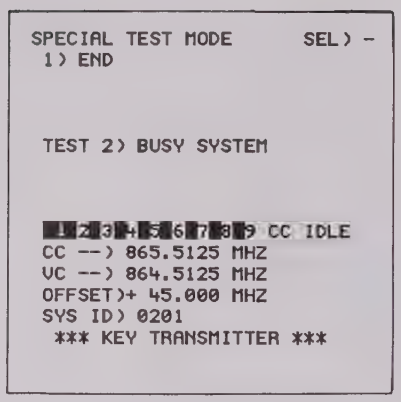
- Thermometer graphic for Trunk I EPII will have seven indications.

```
SPECIAL TEST MODE        SEL) -
 0) MENU
 1) EXIT
 2) START TEST

 TEST 2) BUSY SYSTEM


 1 2 3 4 5 6 7 8 9
 CC TX --) XXX.XXXX MHZ *
 CC RX --) XXX.XXXX MHZ *
 VC TX --) XXX.XXXX MHZ *
 VC RX --) XXX.XXXX MHZ *
 SYS ID) XXXX
```

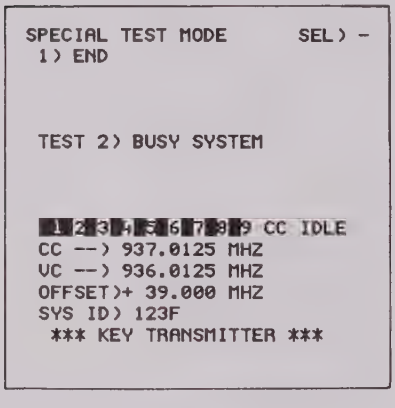
403-430 MHZ TRUNKING

* TX = RADIO'S RECEIVE FREQ
* RX = RADIO'S TRANSMIT FREQ

Figure 7-5.
Busy System Test
Menu Screen


SPECIAL TEST MODE SEL) -
1) END
TEST 2) BUSY SYSTEM
1 2 3 4 5 6 7 8 9 CC IDLE
CC --) 865.5125 MHZ
VC --) 864.5125 MHZ
OFFSET)+ 45.000 MHZ
SYS ID) 0201
*** KEY TRANSMITTER ***

TRUNK I SIGNALING


SPECIAL TEST MODE SEL) -
1) END
TEST 2) BUSY SYSTEM
1 2 3 4 5 6 7 8 9 CC IDLE
CC --) 937.0125 MHZ
VC --) 936.0125 MHZ
OFFSET)+ 39.000 MHZ
SYS ID) 123F
*** KEY TRANSMITTER ***

TRUNK II SIGNALING

● Thermometer graphic for Trunk I EPII will have seven indications.

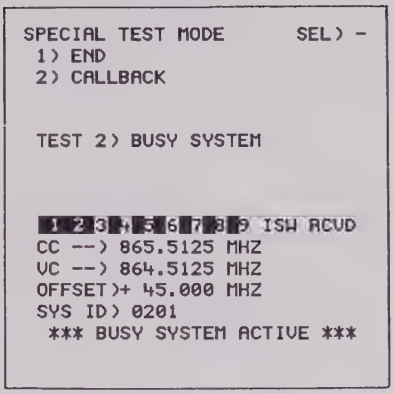
Figure 7-6
Busy System Test Screen

The Test

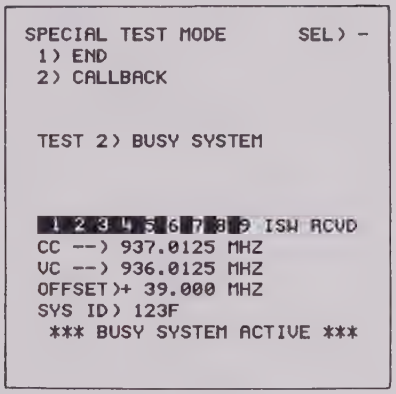
If the operator selects the Start Test function (Key 2) from the Busy System Test menu screen, the R-2021D executes the Busy System Test. The R-2021D displays the the Busy System Test screen, figure 7-6, and prompts the operator with a flashing message and a beeping alarm to KEY TRANSMITTER of the test radio.

The thermometer display stops after 2, (4 if Trunk II signaling) indicating that the R-2021D received the radio's ISW. The R-2021D displays the BUSY SYSTEM ACTIVE at the bottom of the screen, as shown in figure 7-7.

The operator hears a busy tone when the radio is keyed. Press 2 (CALL BACK) to continue the call. The test continues without keying up. The R-2021D stops sending the busy signal and completes the call.


SPECIAL TEST MODE SEL) -
1) END
2) CALLBACK
TEST 2) BUSY SYSTEM
1 2 3 4 5 6 7 8 9 ISW RCVD
CC --) 865.5125 MHZ
VC --) 864.5125 MHZ
OFFSET)+ 45.000 MHZ
SYS ID) 0201
*** BUSY SYSTEM ACTIVE ***

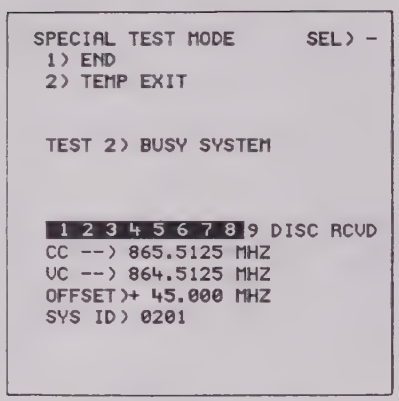
TRUNK I SIGNALING


SPECIAL TEST MODE SEL) -
1) END
2) CALLBACK
TEST 2) BUSY SYSTEM
1 2 3 4 5 6 7 8 9 ISW RCVD
CC --) 937.0125 MHZ
VC --) 936.0125 MHZ
OFFSET)+ 39.000 MHZ
SYS ID) 123F
*** BUSY SYSTEM ACTIVE ***

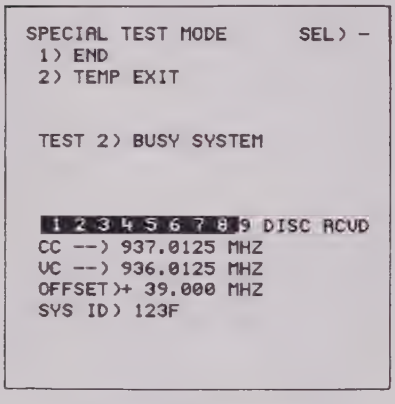
TRUNK II SIGNALING

- Thermometer graphic for Trunk I EPII will have seven indications.

Figure 7-7
Busy System Test Screen: Transmitter Keyed


SPECIAL TEST MODE SEL) -
1) END
2) TEMP EXIT
TEST 2) BUSY SYSTEM
1 2 3 4 5 6 7 8 9 DISC RCVD
CC --) 865.5125 MHZ
VC --) 864.5125 MHZ
OFFSET)+ 45.000 MHZ
SYS ID) 0201

TRUNK I SIGNALING


SPECIAL TEST MODE SEL) -
1) END
2) TEMP EXIT
TEST 2) BUSY SYSTEM
1 2 3 4 5 6 7 8 9 DISC RCVD
CC --) 937.0125 MHZ
VC --) 936.0125 MHZ
OFFSET)+ 39.000 MHZ
SYS ID) 123F

TRUNK II SIGNALING

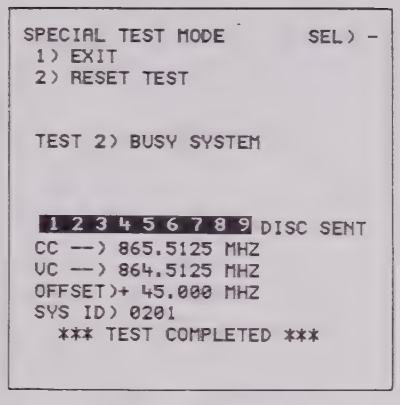
- Thermometer graphic for Trunk I EPII will have seven indications.

Figure 7-8
Busy System Test Screen: Callback

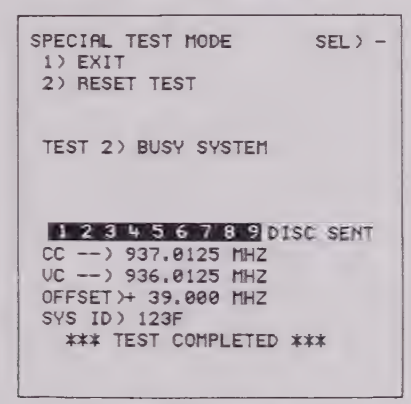
When the operator requests a callback, the R-2021D and the radio complete the call. The remainder of the test is like the Radio Init Test. To complete step 8, the radio must be unkeyed to initiate transmission of the disconnect tone. See figure 7-8. To complete step 9 and end the test, enter 1 at the top of the screen. the R-2021D displays the DISC SENT message to the right of the thermometer and TEST COMPLETED at the bottom of the screen. See figure 7-9.

Mobile Retry Test

Mobile Retry occurs when the radio attempts a call and does not receive a busy signal or a response to the ISW sent. The radio tries up to fifteen times, or until a response is sent. During the Mobile Retry Test, the R-2021D simulates the central controller. The R-2021D ignores all ISWs until the operator requests the R-2021D to accept the ISW. From this point on, the test is the same as the Radio Init Test.

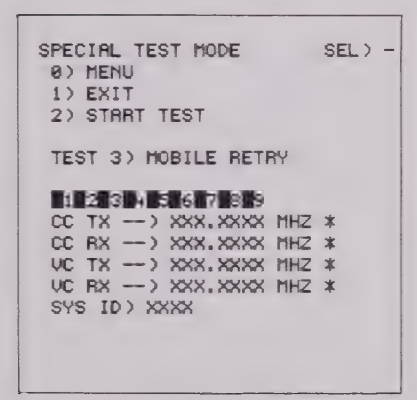

SPECIAL TEST MODE SEL) -
1) EXIT
2) RESET TEST
TEST 2) BUSY SYSTEM
1 2 3 4 5 6 7 8 9 DISC SENT
CC --) 865.5125 MHZ
VC --) 864.5125 MHZ
OFFSET)+ 45.000 MHZ
SYS ID) 0201
*** TEST COMPLETED ***

TRUNK I SIGNALING


SPECIAL TEST MODE SEL) -
1) EXIT
2) RESET TEST
TEST 2) BUSY SYSTEM
1 2 3 4 5 6 7 8 9 DISC SENT
CC --) 937.0125 MHZ
VC --) 936.0125 MHZ
OFFSET)+ 39.000 MHZ
SYS ID) 123F
*** TEST COMPLETED ***

TRUNK II SIGNALING

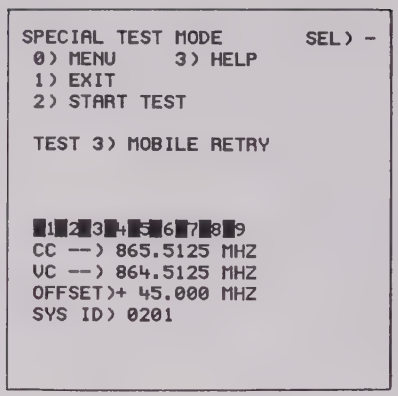
● Thermometer graphic for Trunk I EPII will have seven indications.


SPECIAL TEST MODE SEL) -
0) MENU
1) EXIT
2) START TEST
TEST 3) MOBILE RETRY
1 2 3 4 5 6 7 8 9
CC TX --) XXX.XXXX MHZ *
CC RX --) XXX.XXXX MHZ *
VC TX --) XXX.XXXX MHZ *
VC RX --) XXX.XXXX MHZ *
SYS ID) XXXX

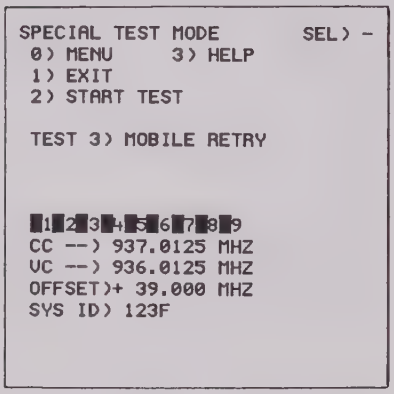
403-430 MHZ TRUNKING

* TX = RADIO'S RECEIVE FREQ
* RX = RADIO'S TRANSMIT FREQ

Figure 7-9
Busy System Test Screen: End


SPECIAL TEST MODE SEL) -
0) MENU 3) HELP
1) EXIT
2) START TEST
TEST 3) MOBILE RETRY
1 2 3 4 5 6 7 8 9
CC --) 865.5125 MHZ
VC --) 864.5125 MHZ
OFFSET)+ 45.000 MHZ
SYS ID) 0201

TRUNK I SIGNALING


SPECIAL TEST MODE SEL) -
0) MENU 3) HELP
1) EXIT
2) START TEST
TEST 3) MOBILE RETRY
1 2 3 4 5 6 7 8 9
CC --) 937.0125 MHZ
VC --) 936.0125 MHZ
OFFSET)+ 39.000 MHZ
SYS ID) 123F

TRUNK II SIGNALING

- Thermometer graphic for Trunk I EPII will have seven indications.

Figure 7-10
Mobile Retry Test Menu Screen

The Test Screen

If the operator selects Mobile Retry (Key 3) from the Special Test mode menu screen, figure 7-1, the R-2021D displays the Mobile Retry Test menu screen in figure 7-10.

If the R-2021D is in one of the other Special Test menu screens, the operator can select the Mobile Retry Test by moving the cursor to the center of the screen by the word TEST, and pressing 3.

In the center of the screen, a thermometer-style graphic shows the major signaling events within the calling process. These signaling events are the same as in the Radio Init Test. Enter the following information in the Mobile Retry screen:

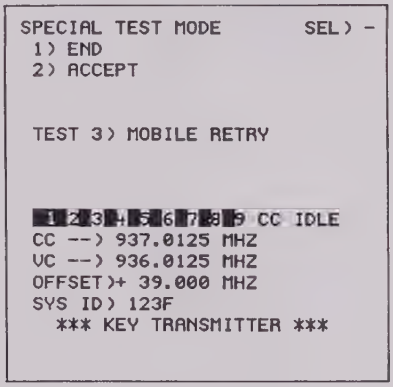
control channel frequency
voice channel frequency
duplex offset frequency
system ID

The Test

If the operator selects the Start Test function (Key 2) from the Mobile Retry Test menu screen, the R-2021D executes the Mobile Retry Test. The R-2021D displays the Mobile Retry Test screen in figure 7-11. If there are no errors in the entered data, the R-2021D prompts the operator with a flashing message and a beeping alarm to KEY TRANSMITTER of the test radio. The R-2021D displays CC IDLE to the right of the thermometer. Key the transmitter and, if auto retry is working, the radio's transmit light will flash several times. The radio sends an ISW on the control channel frequency each time the light flashes to show that it is calling.

SPECIAL TEST MODE SEL) -
1) END
2) ACCEPT
TEST 3) MOBILE RETRY
1 2 3 4 5 6 7 8 9 CC IDLE
CC --) 865.5125 MHZ
VC --) 864.5125 MHZ
OFFSET)+ 45.000 MHZ
SYS ID) 0201
*** KEY TRANSMITTER ***

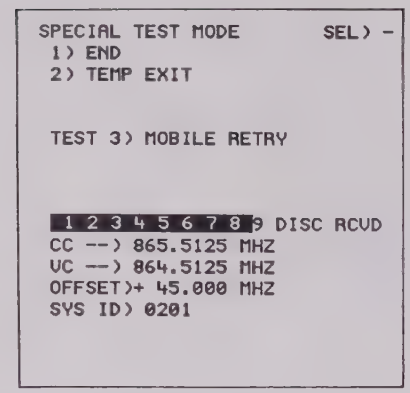
TRUNK I SIGNALING


SPECIAL TEST MODE SEL) -
1) END
2) ACCEPT
TEST 3) MOBILE RETRY
1 2 3 4 5 6 7 8 9 CC IDLE
CC --) 937.0125 MHZ
VC --) 936.0125 MHZ
OFFSET)+ 39.000 MHZ
SYS ID) 123F
*** KEY TRANSMITTER ***

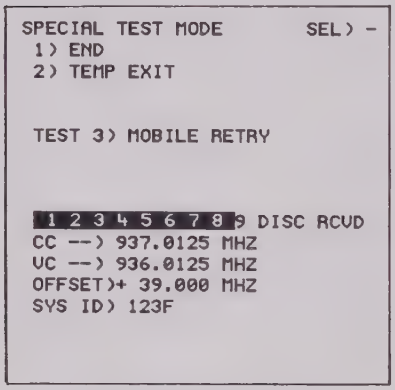
TRUNK II SIGNALING

- Thermometer graphic for Trunk I EPII will have seven indications.

Figure 7-11
Mobile Retry Test Screen


SPECIAL TEST MODE SEL) -
1) END
2) TEMP EXIT
TEST 3) MOBILE RETRY
1 2 3 4 5 6 7 8 9 DISC RCVD
CC --) 865.5125 MHZ
VC --) 864.5125 MHZ
OFFSET)+ 45.000 MHZ
SYS ID) 0201

TRUNK I SIGNALING


SPECIAL TEST MODE SEL) -
1) END
2) TEMP EXIT
TEST 3) MOBILE RETRY
1 2 3 4 5 6 7 8 9 DISC RCVD
CC --) 937.0125 MHZ
VC --) 936.0125 MHZ
OFFSET)+ 39.000 MHZ
SYS ID) 123F

TRUNK II SIGNALING

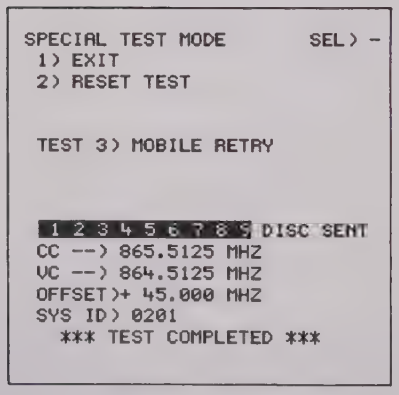
● Thermometer graphic for Trunk I EPII will have seven indications.

Figure 7-12
Mobile Retry Test:
R-2021D Accepts Call

To continue the test, press 2 (ACCEPT) while the radio is retrying. (Note: If 2 is pressed after the radio has finished retrying, the radio must be rekeyed.) The remaining signaling events are like those in the Radio Init Test, except the R-2021D does not display any information.

To complete step 8, unkey the radio to begin transmission of the disconnect tone.

The R-2021D displays figure 7-12 when it accepts the call request from the radio under test.


SPECIAL TEST MODE SEL) -
1) EXIT
2) RESET TEST
TEST 3) MOBILE RETRY
1 2 3 4 5 6 7 8 9 DISC SENT
CC --) 865.5125 MHZ
VC --) 864.5125 MHZ
OFFSET)+ 45.000 MHZ
SYS ID) 0201
*** TEST COMPLETED ***

TRUNK I SIGNALING

To complete step 9 and end the test, press 1. The R-2021D displays DISC SENT to the right of the thermometer and TEST COMPLETED at the bottom of the screen. See figure 7-13.

Call Alert Test

The operator uses the Call Alert Test function to leave an indication that a call was attempted.

If the operator selects Call Alert (Key 4) from the Special Test mode menu screen, figure 7-1, the R-2021D displays the Call Alert Test menu screen in figure 7-14.

If the R-2021D is in one of the other Special Test menu screens, the operator can select the Call Alert Test by moving the cursor to the center of the screen by the word TEST, and pressing 4.

Radio Init Call Alert

A Radio Init Call Alert is a call alert sent to another radio by the test radio. The operator can use this function when another radio cannot be reached. The R-2021D simulates the central controller and the target radio (the unit that the radio being tested is trying to call alert).

The R-2021D waits for the call alert ISW from the radio. When received, the R-2021D displays ID information about the target unit and simulates the target system acknowledging the call alert.

The Test Screen

To choose the Radio Init mode, position the cursor in the middle of the Call Alert screen, by TYPE SEL, and press 1. The R- 2021D displays the Radio Init Call Alert screen in figure 7-14.

For the Radio Init Call Alert Test, enter the following:

control channel frequency
duplex offset frequency
system ID

Also, set the test radio for a call alert type call.

```
SPECIAL TEST MODE          SEL) -
 1) EXIT
 2) RESET TEST


 TEST 3) MOBILE RETRY



 1 2 3 4 5 6 7 8 9 DISC SENT
CC --) 937.0125 MHZ
VC --) 936.0125 MHZ
OFFSET)+ 39.000 MHZ
SYS ID) 123F
  *** TEST COMPLETED ***
```

TRUNK II SIGNALING

● Thermometer graphic for Trunk I EPII will have seven indications.

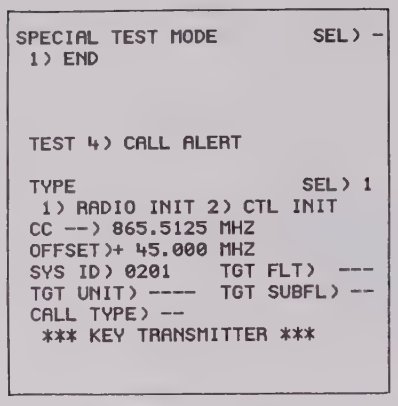
Figure 7-13
Mobile Retry Test: End

```
SPECIAL TEST MODE          SEL) -
 0) MENU       3) HELP
 1) EXIT
 2) START TEST

 TEST 4) CALL ALERT

 TYPE                      SEL) 1
  1) RADIO INIT  2) CTL INIT
 CC --) 865.5125 MHZ
 OFFSET)+ 45.000 MHZ
 SYS ID) 0201
```

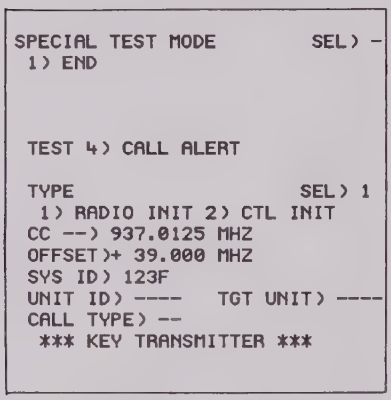
```
SPECIAL TEST MODE          SEL) -
 0) MENU       3) HELP
 1) EXIT
 2) START TEST

 TEST 4) CALL ALERT

 TYPE                      SEL) 1
  1) RADIO INIT  2) CTL INIT
 CC TX --) XXX.XXXX MHZ *
 CC RX --) XXX.XXXX MHZ *

 SYS ID) 0201
```

* TX = RADIO'S RECEIVE FREQ
* RX = RADIO'S TRANSMIT FREQ

Figure 7-14
Call Alert Test Menu Screen: Radio Init Call Alert


SPECIAL TEST MODE SEL) -
1) END
TEST 4) CALL ALERT
TYPE SEL) 1
1) RADIO INIT 2) CTL INIT
CC --) 865.5125 MHZ
OFFSET)+ 45.000 MHZ
SYS ID) 0201 TGT FLT) ---
TGT UNIT) ---- TGT SUBFL) --
CALL TYPE) --
*** KEY TRANSMITTER ***

TRUNK I SIGNALING



TRUNK II SIGNALING

Figure 7-15
Radio Init Call Alert Screen

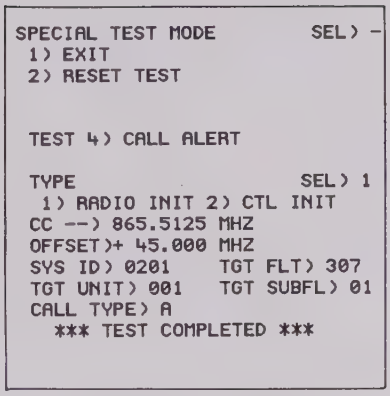
The Test

If the operator selects the Start Test function (Key 2) from the Call Alert Test menu screen, the R-2021D executes a Call Alert Test.

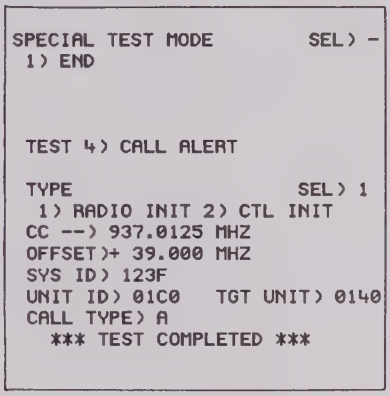
The R-2021D displays a Call Alert Test screen similar to figure 7-15. If all the data entered is correct, the R-2021D prompts the operator with a flashing message and a beeping alarm to key the transmitter of the test radio. When the radio is keyed, it sends the R-2021D a call alert ISW on the control channel frequency.

When the R-2021D receives the ISW. It decodes and displays the target fleet and subfleet ID's (Trunk I signaling) or unit ID (Trunk II signaling), target unit ID, and call type. The call type should be A. See figure 7-16. The radio shows that a call alert has been sent (for example, the radio's transmit light flashes).

The R-2021D automatically sends an acknowledge to simulate the target system acknowledging the call alert. The radio shows that it received the acknowledge signal (for example, the light stops flashing). The R-2021D displays a TEST COMPLETED message.


SPECIAL TEST MODE SEL) -
1) EXIT
2) RESET TEST
TEST 4) CALL ALERT
TYPE SEL) 1
1) RADIO INIT 2) CTL INIT
CC --) 865.5125 MHZ
OFFSET)+ 45.000 MHZ
SYS ID) 0201 TGT FLT) 307
TGT UNIT) 001 TGT SUBFL) 01
CALL TYPE) A
*** TEST COMPLETED ***

TRUNK I SIGNALING



TRUNK II SIGNALING

Figure 7-16
Radio Init Call Alert: Transmitter Keyed

```
SPECIAL TEST MODE          SEL> -
 0> MENU       3> HELP
 1> EXIT
 2> START TEST

 TEST 4> CALL ALERT

 TYPE                      SEL> 2
 1> RADIO INIT 2> CTL INIT
 CC --> 865.5125 MHZ
 OFFSET>+ 45.000 MHZ
 SYS ID> 0201     FLEET ID> 307
 UNIT ID> 01E     SUBFL ID>  01
```

TRUNK I SIGNALING

```
SPECIAL TEST MODE          SEL> -
 0> MENU       3> HELP
 1> EXIT
 2> START TEST

 TEST 4> CALL ALERT

 TYPE                      SEL> 2
  1> RADIO INIT 2> CTL INIT
 CC --> 937.0125 MHZ
 OFFSET>+ 39.000 MHZ
 SYS ID> 123F
 TGT ID> 01C0 CALLING ID> 0140
```

TRUNK II SIGNALING

```
SPECIAL TEST MODE          SEL> -
 0> MENU       3> HELP
 1> EXIT
 2> START TEST

 TEST 4> CALL ALERT

 TYPE                      SEL> 2
  1> RADIO INIT  2> CTL INIT
 CC TX --> XXX.XXXX MHZ *
 CC RX --> XXX.XXXX MHZ *

 SYS ID> XXXX CALL TYPE> --
 TGT ID> XXXXXX CALLING> XXXXXX
```

403-430 MHZ TRUNKING

* TX = RADIO'S RECEIVE FREQ
* RX = RADIO'S TRANSMIT FREQ

Figure 7-17
Call Alert Test Menu Screen: Controller Init Call Alert

Controller Init Call Alert

A Controller Init Call Alert is a call alert from another radio to the test radio. The R-2021D simulates both the controller and a radio trying to alert the test radio. The R-2021D outputs a background idle pattern on the control channel frequency. When the operator requests that the R-2021D send an outbound alert, a call alert word is sent on the control channel. The radio sends information to show that it received the call alert. The R-2021D decodes and verifies the information, but does not display it.

The Test Screen

To choose the Controller Init mode, position the cursor in the middle of the Call Alert screen, by TYPE SEL, and press 2. The R-2021D displays the Controller Init Call Alert screen in figure 7-17.

For the Controller Init Call Alert test, enter:

control channel frequency
duplex offset frequency
system ID
unit ID
fleet ID (Trunk I signaling)
subfleet ID (Trunk I signaling)

Note: The operator must use a subfleet ID of 01.

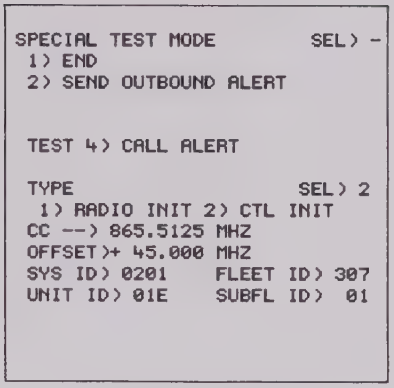
---

target unit ID (Trunk II signaling)
calling unit ID (Trunk II signaling)

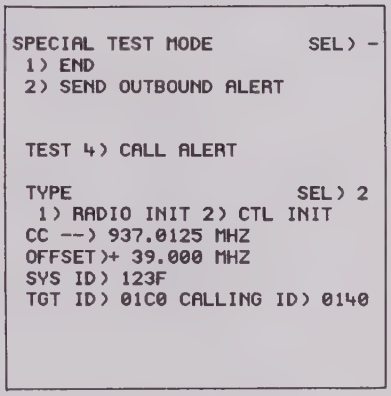
The Test

If the operator selects the Start Test function (Key 2) from the Call Alert Test menu screen, the R-2021D displays a screen similar to figure 7-18. If a problem exists with the entered data, an error message appears.

If there are no errors, the R-2021D displays the SEND OUTBOUND ALERT (function 2) as shown in figure 7-18. Now the control channel is active. The R-2021D sends a background idle pattern (background OSW) on the control channel frequency to lock the radio. Press 2 (SEND OUTBOUND ALERT). The R-2021D simulates sending a call alert word to the radio on the control channel frequency. The radio shows that a call alert was received (for example, a flashing light).


SPECIAL TEST MODE SEL) -
1) END
2) SEND OUTBOUND ALERT
TEST 4) CALL ALERT
TYPE SEL) 2
1) RADIO INIT 2) CTL INIT
CC --) 865.5125 MHZ
OFFSET)+ 45.000 MHZ
SYS ID) 0201 FLEET ID) 307
UNIT ID) 01E SUBFL ID) 01

TRUNK I SIGNALING


SPECIAL TEST MODE SEL) -
1) END
2) SEND OUTBOUND ALERT
TEST 4) CALL ALERT
TYPE SEL) 2
1) RADIO INIT 2) CTL INIT
CC --) 937.0125 MHZ
OFFSET)+ 39.000 MHZ
SYS ID) 123F
TGT ID) 01C0 CALLING ID) 0140

TRUNK II SIGNALING

Figure 7-18
Controller Init Call Alert

```
SPECIAL TEST MODE          SEL> -
 1> EXIT
 2> RESET TEST


 TEST 4> CALL ALERT

 TYPE                      SEL> 2
 1> RADIO INIT 2> CTL INIT
 CC --> 865.5125 MHZ
 OFFSET>+ 45.000 MHZ
 SYS ID> 0201     FLEET ID> 307
 UNIT ID> 01E     SUBFL ID>  01

   *** TEST COMPLETED ***
```

TRUNK I SIGNALING

```
SPECIAL TEST MODE          SEL> -
 1> EXIT
 2> RESET TEST


 TEST 4> CALL ALERT

 TYPE                      SEL> 2
  1> RADIO INIT 2> CTL INIT
 CC --> 937.0125 MHZ
 OFFSET>+ 39.000 MHZ
 SYS ID> 123F
 TGT ID> 01C0 CALLING ID> 0140

   *** TEST COMPLETED ***
```

TRUNK II SIGNALING

Figure 7-19
Controller Init Call Alert: Outbound Alert Sent

The radio sends back ID information to acknowledge the call alert. The R-2021D decodes the ID information to make sure it is correct and displays TEST COMPLETED. The R-2021D does not display the received ID information. See figure 7-19.

Private Call Test

The Private Call function allows the operator of one radio to talk to the central dispatcher or another radio without any other radio on the system receiving the call.

In Trunk I signaling there are two types of private call, Level 1, and Level 2. An individual radio can only do a Level 1 or a Level 2 type call.

In a Level 1 private call, a supervisor's radio may call any radio in the fleet or subfleet. If the radio is not a supervisors radio, the operator can only call the dispatcher. In a Level 2 private call, the radio may call any radio in its system.

In the Private Call Test, the R-2021D simulates both the central controller and the dispatcher. In a Level 1 private call, the R-2021D handles the test like a Radio Init Test and displays the target radio's ID information.

In a Level 2 private call, the R-2021D simulates a private call to one radio only. The test progresses as in a Radio Init Test and the R-2021D displays the target and radio information.

With Trunk II signaling, only a call corresponding to a Level 2 call is available. Also with Trunk II signaling, a standard or enhanced Private Call Test is available.

The Test Screen

If the operator selects Private Call (Key 5) from the Special Test mode menu screen, figure 7-1, the R-2021D displays the Private Call Test menu screen in figure 7-20.

If the R-2021D is in one of the other Special Test menu screens, the operator can select the Private Call Test by moving the cursor to the center of the screen, by the word TEST, and pressing 5.

Note: With Trunk I signaling, the operator must perform a Radio Init Private Call Test before a Controller Init Private Call Test. With Trunk II signaling, the operator may perform the tests independently. See figure 7-20.

For the Private Call Test, enter the following information:

control channel frequency
duplex offset frequency
voice channel frequency
system ID
unit ID (Trunk II signaling, Controller Init Private Call)
target unit ID (Trunk II signaling, Controller Init Private Call)

Also, set the test radio for a private call (unnecessary if a Controller Init Private Call Test).

```
SPECIAL TEST MODE          SEL) -
 0) MENU      3) HELP
 1) EXIT
 2) START TEST

 TEST 5) PRIVATE CALL



 CC --) 865.5125 MHZ
 VC --) 864.5125 MHZ
 OFFSET)+ 45.000 MHZ
 SYS ID) 0201
```

TRUNK I SIGNALING

```
SPECIAL TEST MODE          SEL) -
 0) MENU      3) HELP
 1) EXIT
 2) START TEST

 TEST 5) PRIVATE CALL
 1)RAD INIT 2)CTL INIT   SEL) 1
 1)STANDARD 2)ENHANCED   SEL) 1

 CC --) 937.0125 MHZ
 VC --) 936.0125 MHZ
 OFFSET)+ 39.000 MHZ
 SYS ID) 123F
```

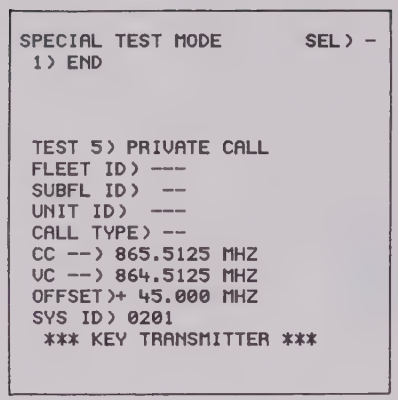
TRUNK II SIGNALING

```
SPECIAL TEST MODE          SEL) -
 0) MENU      3) HELP
 1) EXIT
 2) START TEST

 TEST 5) PRIVATE CALL
 1)RAD INIT 2)CTL INIT   SEL) 1

 CC TX --) XXX.XXXX MHZ *
 CC RX --) XXX.XXXX MHZ *
 VC TX --) XXX.XXXX MHZ *
 VC RX --) XXX.XXXX MHZ *
 SYS ID) 123F
```

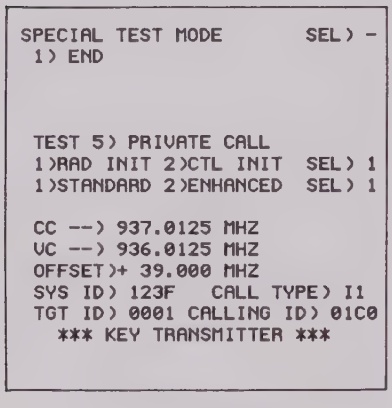
403-430 MHZ TRUNKING

* TX = RADIO'S RECEIVE FREQ
* RX = RADIO'S TRANSMIT FREQ

Figure 7-20
Private Call Test
Menu Screen



TRUNK I SIGNALING


SPECIAL TEST MODE SEL) -
1) END
TEST 5) PRIVATE CALL
1)RAD INIT 2)CTL INIT SEL) 1
1)STANDARD 2)ENHANCED SEL) 1
CC --) 937.0125 MHZ
VC --) 936.0125 MHZ
OFFSET)+ 39.000 MHZ
SYS ID) 123F CALL TYPE) I1
TGT ID) 0001 CALLING ID) 01C0
*** KEY TRANSMITTER ***

TRUNK II SIGNALING

Figure 7-21
Private Call Test Screen

The Test

If the operator selects the Start Test function (Key 2) from the Private Call Test menu screen, the R-2021D executes the Private Call Test and displays a screen similar to figure 7-21 if it is a Radio Init Private Call. The R-2021D prompts the operator with a flashing message and beeping alarm to KEY TRANSMITTER of the test radio.

When the transmitter of the test radio has been keyed, the R- 2021D displays a screen similar to figure 7-22 if no errors occur.

Note: After keying the radio, the R-2021D determines the Call Type.

Trunk I Signaling:

If the radio is making a Level 1 private call, the R-2021D displays the fleet, subfleet, and unit ID. If the radio is making a Level 2 private call, the R-2021D displays the target fleet, target subfleet, and target unit ID in addition to the sending radio's ID information. In both Level 1 and Level 2 calls, dekey the radio to begin transmission of the disconnect tone. At this point, the operator can end the test or continue to the Controller Init Private Call. See figure 7-22.

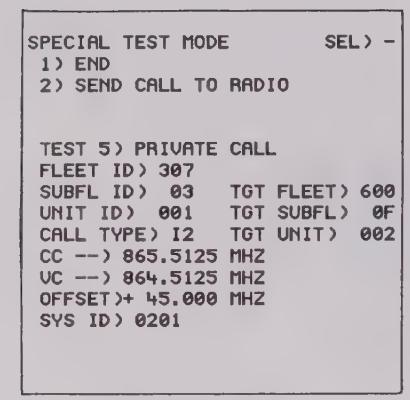
```
SPECIAL TEST MODE          SEL) -
 1) END
 2) TEMP EXIT
 3) CONTINUE TO CTL TEST

 TEST 5) PRIVATE CALL
 FLEET ID) 307
 SUBFL ID)  03  TGT FLEET) 600
 UNIT ID)  001  TGT SUBFL)  0F
 CALL TYPE) I2  TGT UNIT)  001
 CC --) 865.5125 MHZ
 VC --) 864.5125 MHZ
 OFFSET)+ 45.000 MHZ
 SYS ID) 0201
 *** VOICE CHANNEL ACTIVE ***
```

TRUNK I SIGNALING

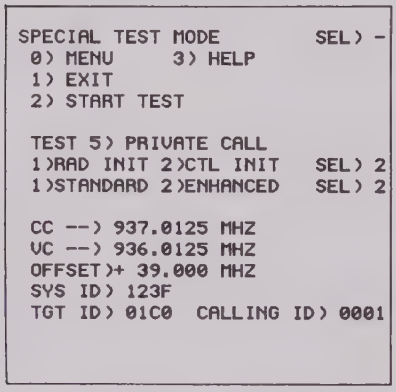
```
SPECIAL TEST MODE          SEL) -
 1) END
 2) TEMP EXIT


 TEST 5) PRIVATE CALL
 1)RAD INIT 2)CTL INIT    SEL) 1
 1)STANDARD 2)ENHANCED    SEL) 1

 CC --) 937.0125 MHZ
 VC --) 936.0125 MHZ
 OFFSET)+ 39.000 MHZ
 SYS ID) 123F  CALL TYPE) I1
 TGT ID) 0001  CALLING ID) 01C0
  *** VOICE CHANNEL ACTIVE ***
```

TRUNK II SIGNALING

Figure 7-22
Private Call:
Transmitter Keyed


SPECIAL TEST MODE SEL) -
1) END
2) SEND CALL TO RADIO
TEST 5) PRIVATE CALL
FLEET ID) 307
SUBFL ID) 03 TGT FLEET) 600
UNIT ID) 001 TGT SUBFL) 0F
CALL TYPE) I2 TGT UNIT) 002
CC --) 865.5125 MHZ
VC --) 864.5125 MHZ
OFFSET)+ 45.000 MHZ
SYS ID) 0201

TRUNK I SIGNALING


SPECIAL TEST MODE SEL) -
0) MENU 3) HELP
1) EXIT
2) START TEST
TEST 5) PRIVATE CALL
1)RAD INIT 2)CTL INIT SEL) 2
1)STANDARD 2)ENHANCED SEL) 2
CC --) 937.0125 MHZ
VC --) 936.0125 MHZ
OFFSET)+ 39.000 MHZ
SYS ID) 123F
TGT ID) 01C0 CALLING ID) 0001

TRUNK II SIGNALING

Figure 7-23
Private Call:
Continue to Controller Test

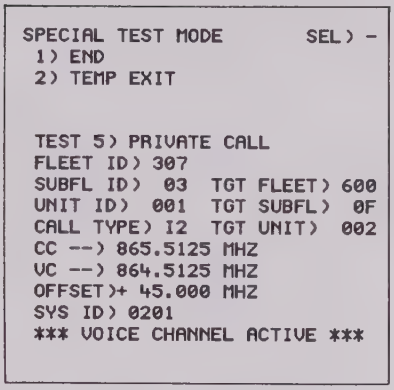
The R-2021D displays a new function, SEND CALL TO RADIO, near the top of the screen after the start of the Controller Init Private Call Test. At this point, the operator can change the unit ID if sending a Level 1 Private Call. See figure 7-23.

Trunk II Signaling:

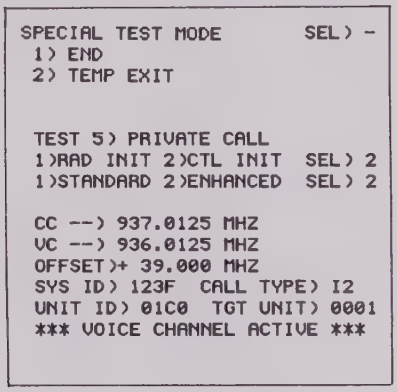
With Trunk II signaling, the R-2021D shows the unit ID and target unit ID. See figure 7-22. After resetting the test, the operator can execute the Controller Init Private Call Test. Recall that with Trunk II signaling, the operator can execute the Controller Init Private Call Test prior to the Radio Init Private Call Test, if desired.

At this point, the operator can change the unit ID and target unit ID. See figure 7-23.

For either signaling type, press 2 to start the Controller Init Private Call Test. The test continues as in Controller Init Test except the radio shows that it received a private call (for example, a light flashes on the radio). The voice channel activates if the call is answered. See figure 7-24.


SPECIAL TEST MODE SEL) -
1) END
2) TEMP EXIT
TEST 5) PRIVATE CALL
FLEET ID) 307
SUBFL ID) 03 TGT FLEET) 600
UNIT ID) 001 TGT SUBFL) 0F
CALL TYPE) I2 TGT UNIT) 002
CC --) 865.5125 MHZ
VC --) 864.5125 MHZ
OFFSET)+ 45.000 MHZ
SYS ID) 0201
*** VOICE CHANNEL ACTIVE ***

TRUNK I SIGNALING


SPECIAL TEST MODE SEL) -
1) END
2) TEMP EXIT
TEST 5) PRIVATE CALL
1)RAD INIT 2)CTL INIT SEL) 2
1)STANDARD 2)ENHANCED SEL) 2
CC --) 937.0125 MHZ
VC --) 936.0125 MHZ
OFFSET)+ 39.000 MHZ
SYS ID) 123F CALL TYPE) I2
UNIT ID) 01C0 TGT UNIT) 0001
*** VOICE CHANNEL ACTIVE ***

TRUNK II SIGNALING

Figure 7-24
Private Call:
Send Call To Radio

```
SPECIAL TEST MODE          SEL) -
 1) EXIT
 2) RESET TEST


 TEST 5) PRIVATE CALL
 FLEET ID) 307
 SUBFL ID)  03    TGT FLEET) 600
 UNIT ID)  001    TGT SUBFL)  0F
 CALL TYPE) I2    TGT UNIT)  002
 CC --) 865.5125 MHZ
 VC --) 864.5125 MHZ
 OFFSET)+ 45.000 MHZ
 SYS ID) 0201
   *** TEST COMPLETED ***
```

TRUNK I SIGNALING

```
SPECIAL TEST MODE          SEL) -
 1) EXIT
 2) RESET TEST


 TEST 5) PRIVATE CALL
 1)RAD INIT 2)CTL INIT    SEL) 2
 1)STANDARD 2)ENHANCED    SEL) 2

 CC --) 937.0125 MHZ
 VC --) 936.0125 MHZ
 OFFSET)+ 39.000 MHZ
 SYS ID) 123F    CALL TYPE) I2
 UNIT ID) 01C0  TGT UNIT) 0001
   *** TEST COMPLETED ***
```

TRUNK II SIGNALING

```
SPECIAL TEST MODE          SEL)
 0) MENU        3) HELP
 1) EXIT
 2) START TEST


 TEST 5) PRIVATE CALL
 1) RAD INIT 2)CTL INIT  SEL) 2

 CC TX --) XXX.XXXX MHZ *
 CC RX --) XXX.XXXX MHZ *
 VC TX --) XXX.XXXX MHZ *
 VC RX --) XXX.XXXX MHZ *
 SYS ID) XXXX    CALL TYPE) I2
 TGT ID)  XXXX  CALLING) XXXX
```

403–430 MHZ TRUNKING

* TX = RADIO'S RECEIVE FREQ
* RX = RADIO'S TRANSMIT FREQ

Figure 7-25
Private Call: End

```
 SPECIAL TEST MODE          SEL) -
  0) MENU      3) HELP
  1) EXIT
  2) START TEST

  TEST 6) EMERGENCY




  CC --) 865.5125 MHZ
  OFFSET)+ 45.000 MHZ
  SYS ID) 0201
```

Figure 7-26
Emergency Test Menu Screen

If ending the test, the R-2021D sends a disconnect pattern to the radio on the voice channel frequency to return the radio to the control channel. Upon completion of the Private Call Test, the R-2021D displays a TEST COMPLETED message. See figure 7-25.

Emergency Test

In an emergency call, the radio sends the dispatcher an emergency alarm ISW on the control channel. The controller opens a voice channel for the requesting radio even if all voice channels are full. The central controller acknowledges the message by sending an emergency OSW on the control channel.

In the Emergency Test, the R-2021D simulates the central controller and the dispatcher. The test is similar to a Radio Init Test, except the radio sends an emergency ISW. The R-2021D responds by sending an OSW, and an acknowledge to the emergency call.

Note: The Emergency function only tests an emergency alarm.

The Test Screen

If the operator selects Emergency (Key 6) from the Special Test mode menu screen, figure 7-1, the R-2021D displays the Emergency Test menu screen in figure 7-26.

If the R-2021D is in one of the other Special Test menu screens, the operator can select the Emergency Test by moving the cursor to the center of the screen, by the word TEST, and pressing 6.

Enter the following information:

control channel frequency
duplex offset frequency
system ID

The Test

If the operator selects the Start Test function (Key 2) from the Emergency Test menu screen, the R-2021D executes the Emergency Test and displays a screen similar to figure 7-27. If the entered data is correct, the R-2021D prompts the operator with a flashing message and a beeping alarm to KEY TRANSMITTER of the test radio.

Press the emergency switch to begin the call. The radio sends an emergency alarm ISW on the control channel. The radio continues sending emergency alarm words until the R-2021D responds.

```
SPECIAL TEST MODE          SEL) -
 1) END


 TEST 6) EMERGENCY
 FLEET ID) ---
 SUBFL ID)  --
 UNIT ID)  ---
 CALL TYPE) --

 CC --) 865.5125 MHZ
 OFFSET)+ 45.000 MHZ
 SYS ID) 0201
 *** KEY TRANSMITTER ***
```

TRUNK I SIGNALING

```
SPECIAL TEST MODE          SEL) -
 1) END


 TEST 6) EMERGENCY

 TALK GRP) ---
 UNIT ID) ----
 CALL TYPE) --

 CC --) 937.0125 MHZ
 OFFSET)+ 39.000 MHZ
 SYS ID) 123F
 *** KEY TRANSMITTER ***
```

TRUNK II SIGNALING

```
SPECIAL TEST MODE          SEL) -
 0) MENU        3) HELP
 1) EXIT
 2) START TEST

 TEST 6) EMERGENCY


 CC TX --) XXX.XXXX MHZ *
 CC RX --) XXX.XXXX MHZ *


 SYS ID) XXXX
```

403-430 MHZ TRUNKING

* TX = RADIO'S TRANSMIT FREQ
* RX = RADIO'S RECEIVE FREQ

Figure 7-27
Emergency Test Mode Screen.

```
SPECIAL TEST MODE          SEL) -
 1) EXIT
 2) RESET TEST


 TEST 6) EMERGENCY
 FLEET ID) 307
 SUBFL ID)  01
 UNIT ID)  01E
 CALL TYPE) E1

 CC --) 865.5125 MHZ
 OFFSET)+ 45.000 MHZ
 SYS ID) 0201
  *** TEST COMPLETED ***
```

TRUNK I SIGNALING

```
SPECIAL TEST MODE          SEL) -
 1) EXIT
 2) RESET TEST


 TEST 6) EMERGENCY

 TALK GRP)  140
 UNIT ID)  01C0
 CALL TYPE) E1

 CC --) 937.0125 MHZ
 OFFSET)+ 39.000 MHZ
 SYS ID) 123F
 *** VOICE CHANNEL ACTIVE ***
```

TRUNK II SIGNALING

Figure 7-28
Emergency Test Mode: Transmitter Keyed

The R-2021D, simulating the central controller, responds to the ISW by sending an emergency OSW on the control channel. The R-2021D then sends an acknowledge, which simulates the dispatcher acknowledging the emergency call. Then, the R-2021D displays the radio's fleet ID, subfleet ID, unit ID, (or unit ID and talk group, if Trunk II signaling), and call type. See figure 7-28.

The test ends after the response and acknowledge are sent. The R-2021D displays TEST COMPLETED. See figure 7-28.

Phone Interconnect Test

Phone Interconnect allows the radio to talk to another party through standard telephone lines. The Phone Interconnect Special Test has two types, the Radio Init Phone Interconnect, and the Controller Init Phone Interconnect. The operator performs the Radio Init Phone Interconnect first.

If the operator selects Phone Interconnect (Key 7) from the Special Test mode menu screen, figure 7-1, the R-2021D displays the Phone Interconnect Test menu in figure 7-29.

If the R-2021D is in one of the other Special Test menu screens, the operator can select the Phone Interconnect Test by moving the cursor to the center of the screen, by the word TEST, and pressing 7.

Radio Init Phone Interconnect

In the Radio Init Phone Interconnect, the radio makes a phone call. The controller assigns a voice channel to the radio and puts a dial tone on the voice channel. After the radio sends an access number, the operator may use the radio to communicate on standard telephone lines.

During the Radio Init Phone Interconnect Test, the R-2021D simulates the central controller. After receiving the phone interconnect ISW, the R-2021D continues with the same type of acknowledge and connect signaling as in a Radio Init Test until on the voice channel. When on the voice channel, it is possible to encode and decode DTMF and also work in full duplex (if the radio is so equipped).

```
SPECIAL TEST MODE          SEL) -
 0) MENU      3) HELP
 1) EXIT
 2) START TEST

 TEST 7) PHONE INTERCONN



 CC --) 865.5125 MHZ
 VC --) 864.5125 MHZ
 OFFSET)+ 45.000 MHZ
 SYS ID) 0201
```

The Test

The following information must be entered:

control channel frequency
voice channel frequency
duplex offset frequency
system ID

If the operator selects the Start Test function (Key 2) from the Phone Interconnect Test menu screen, the R-2021D executes the Phone Interconnect Test and displays a screen similar to figure 7-30. The R-2021D prompts the operator with a flashing message and beeping alarm to KEY TRANSMITTER of the test radio. See figure 7-30.

Press the phone interconnect call button on the radio to begin a phone interconnect call. When the operator presses the call button, the radio sends a phone interconnect ISW on the control channel frequency. The R-2021D decodes the received phone interconnect ISW and displays the radio's fleet ID and unit ID (unit ID only if Trunk II signaling), and the call type.

```
SPECIAL TEST MODE        SEL) -
 0) MENU      3) HELP
 1) EXIT
 2) START TEST

 TEST 7) PHONE INTERCONN
 UNIT ID)     XXXX
 CALL TYPE      XX
 CC TX --) XXX.XXXX MHZ *
 CC RX --) XXX.XXXX MHZ *
 VC TX --) XXX.XXXX MHZ *
 VC RX --) XXX.XXXX MHZ *

 SYS ID)  XXXX
```

403-430 MHZ TRUNKING

* TX = RADIO'S RECEIVE FREQ
* RX = RADIO'S TRANSMIT FREQ

Figure 7-29
Phone Interconnect Test Menu Screen

```
SPECIAL TEST MODE        SEL) -
 1) END


 TEST 7) PHONE INTERCONN

 FLEET ID) ---
 UNIT ID)  ---
 CALL TYPE) --
 CC --) 865.5125 MHZ
 VC --) 864.5125
 OFFSET)+ 45.000 MHZ
 SYS ID) 0201
  *** KEY TRANSMITTER ***
```

TRUNK I SIGNALING

```
SPECIAL TEST MODE        SEL) -
 1) END


 TEST 7) PHONE INTERCONN

 UNIT ID)  ----
 CALL TYPE) --

 CC --) 937.0125 MHZ
 VC --) 936.0125
 OFFSET)+ 39.000 MHZ
 SYS ID) 123F
 *** KEY TRANSMITTER ***
```

TRUNK II SIGNALING

Figure 7-30
Phone Interconnect Test: Start Test

```
SPECIAL TEST MODE          SEL) -
 1) END
 2) TEMP EXIT
 3) DTMF ENCODE/DECODE
 4) TEST PHONE HANGUP
 TEST 7) PHONE INTERCONN

 FLEET ID) 307
 UNIT ID)  01E
 CALL TYPE) P1
 CC --) 865.5125 MHZ
 VC --) 864.5125
 OFFSET)+ 45.000 MHZ
 SYS ID) 0201
 *** VOICE CHANNEL ACTIVE ***
```

TRUNK I SIGNALING

```
SPECIAL TEST MODE          SEL) -
 1) END
 2) TEMP TEST
 3) DTMF ENCODE/DECODE
 4) TEST PHONE HANGUP
 TEST 7) PHONE INTERCONN

 TALK GRP)  140
 UNIT ID)  01C0
 CALL TYPE) P1
 CC --) 937.0125 MHZ
 VC --) 936.0125
 OFFSET)+ 39.000 MHZ
 SYS ID) 123F
 *** VOICE CHANNEL ACTIVE ***
```

TRUNK II SIGNALING

Figure 7-31
Phone Interconnect Test: Transmitter Keyed

```
DTMF ENCODE/DECODE (SPFC 15)
0)HELP 1)EXIT 2)RESET DECODE -

DTMF DECODE

------------------------------

DTMF ENCODE                SEL) -


BURST ENCODE NUMBER
*0#123456789ABCD*0#123456789AB
  PANEL SWITCHES INACTIVE
TONE) 0100 MS   DELAY) 0050 MS
```

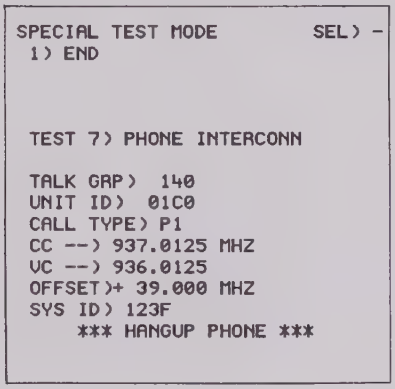
Figure 7-32
DTMF Encode/Decode

The R2021D completes acknowledge and connect signaling like in the Radio Init Test, except a phone interconnect OSW is sent rather than the usual channel grant OSW and the test stops after the radio sends the R-2021D a connect word on the voice channel. The R-2021D displays two new functions: DTMF ENCODE/DECODE and TEST PHONE HANGUP, as shown in figure 7-31.

At this point, the radio should be on the voice channel. To test the DTMF capability of the radio, press 3 (DTMF ENCODE/DECODE) to decode the DTMF characters the radio sends when entering numbers on the radio keypad. See figure 7-32. After checking the DTMF capability of the radio, press 1 to return to the Phone Interconnect (Radio Init) Test screen.

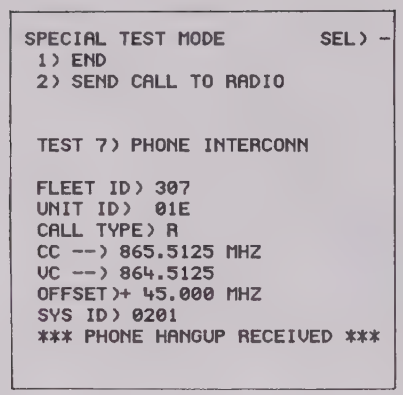
To test the phone interconnect hangup capability, press 4 (TEST PHONE HANGUP). After pressing 4, the R-2021D returns to the control channel and waits for a hangup button on the radio to send the phone interconnect hangup ISW. See figure 7-33.

TRUNK I SIGNALING

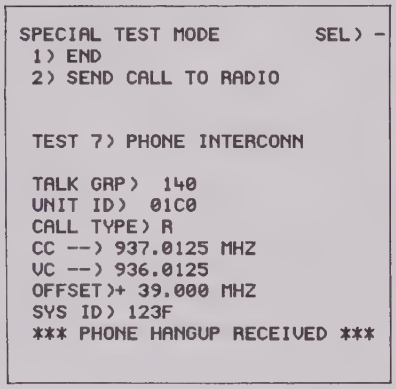


TRUNK II SIGNALING

Figure 7-33
Phone Interconnect Test: Test Phone Hangup



TRUNK I SIGNALING



TRUNK II SIGNALING

Figure 7-34
Phone Interconnect Test:
Phone Hangup Executed

The R-2021D outputs a phone interconnect hangup acknowledge to the radio on the control channel and completes the Radio Init portion of the Phone Interconnect Test. The screen displays function 2 (SEND CALL TO RADIO), as shown in figure 7-34. Run the Controller Init Phone Interconnect Test by pressing 2 or end the test by pressing 1.

Controller Init Phone Interconnect

In the Controller Init Phone Interconnect, the radio receives a phone call. The R-2021D tests this capability by simulating the controller and calling the radio. When the operator requests the R-2021D to send a call to the radio, the R-2021D sends a ring OSW on the control channel.

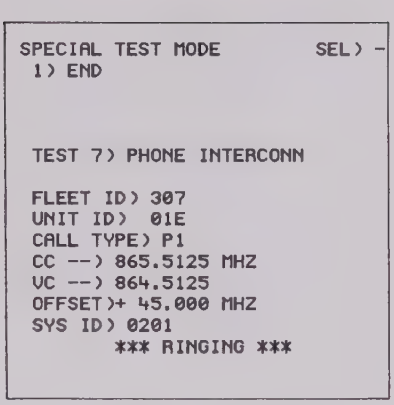
Note: If you want to do the Controller Init Phone Interconnect Test, you must first run the Radio Init Phone Interconnect Test. This is because the R-2021D has to determine the type of radio.

The Test

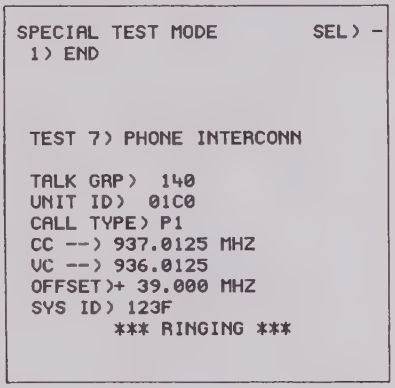
The Controller Init Phone Interconnect screen retains all information displayed on the screen when the Radio Init Interconnect Test ends. The operator cannot change or enter information. Press 2 (SEND CALL TO RADIO) and the R-2021D sends the radio a transpond ISW automatically.

After the R-2021D receives the transpond ISW, it outputs a ring OSW on the control channel. The radio should now start ringing like a telephone. See figure 7-35. Press the key on the radio for phone off-hook, and the radio sends a mobile request ISW on the control channel.

After the radio is on the voice channel, the screen displays function 3, DTMF ENCODE/DECODE, and function 4, TEST PHONE HANGUP.



TRUNK I SIGNALING



TRUNK II SIGNALING

Figure 7-35
Phone Interconnect Test: Send Call To Radio

```
SPECIAL TEST MODE          SEL) -
 1) END
 2) RESET TEST

 TEST 7) PHONE INTERCONN

 FLEET ID) 307
 UNIT ID)  01E
 CALL TYPE) R
 CC --) 865.5125 MHZ
 VC --) 864.5125
 OFFSET)+ 45.000 MHZ
 SYS ID) 0201
   *** TEST COMPLETED ***
```

TRUNK I SIGNALING

```
SPECIAL TEST MODE          SEL) -
 1) END
 2) RESET TEST

 TEST 7) PHONE INTERCONN

 TALK GRP)  140
 UNIT ID)  01C0
 CALL TYPE) R
 CC --) 937.0125 MHZ
 VC --) 936.0125
 OFFSET)+ 39.000 MHZ
 SYS ID) 123F
   *** TEST COMPLETED ***
```

TRUNK II SIGNALING

Figure 7-36
Phone Interconnect Test:
End Test Executed

At this point, the test is similar to Radio Init Phone Interconnect Test. The only difference is that after testing phone hangup (function 4), the test ends automatically and the R-2021D displays TEST COMPLETED as in figure 7-36.

Dynamic Regroup Request Test

Dynamic regroup allows a dispatcher to change the fleet or subfleet (or talk group if Trunk II signaling) assignment of a radio or group of radios without any activity required by the radio users. In the dynamic regroup test, the R-2021D will not actually regroup a radio, but will decode a dynamic regroup request from the test radio. The R-2021D sends an acknowledge and completes the test. This verifies the programming of the radio and the function of the selector switch.

In the Dynamic Regroup Test, the R-2021D simulates the central controller. The radio sends a dynamic regroup request ISW on the control channel frequency. The R-2021D responds by sending acknowledge words on the control channel to acknowledge the ISW. The R-2021D decodes the ISW and displays the radio's fleet ID, subfleet ID, unit ID (unit ID and talk group if Trunk II signaling) information and the call type.

```
SPECIAL TEST MODE          SEL) -
 0) MENU      3) HELP
 1) EXIT
 2) START TEST

 TEST 8) DYN REGRP REQ




 CC --) 865.5125 MHZ
 OFFSET)+ 45.000 MHZ
 SYS ID) 0201
```

The Test Screen

If the operator selects Dynamic Regroup (Key 8) from the Special Test mode menu screen, figure 7-1, the R-2021D displays the Dynamic Regroup Test menu screen in figure 7-37.

If the R-2021D is in one of the other Special Test menu screens, the operator can select the Dynamic Regroup Test by moving the cursor to the center of the screen, by the word TEST, and pressing 8.

At the bottom of the screen, enter:

control channel frequency
duplex offset frequency
system ID

The Test

If the operator selects the Start Test function (Key 2) from the Dynamic Regroup menu screen, the R-2021D executes the Dynamic Regroup Test and displays a screen similar to figure 7-38. If the data has been entered correctly, the R-2021D prompts the operator with a flashing message and a beeping alarm to KEY TRANSMITTER of the test radio.

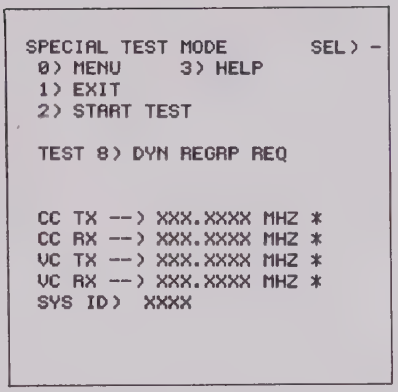

SPECIAL TEST MODE SEL) -
0) MENU 3) HELP
1) EXIT
2) START TEST
TEST 8) DYN REGRP REQ
CC TX --) XXX.XXXX MHZ *
CC RX --) XXX.XXXX MHZ *
VC TX --) XXX.XXXX MHZ *
VC RX --) XXX.XXXX MHZ *
SYS ID) XXXX
403-430 MHZ TRUNKING
* TX = RADIO'S RECEIVE FREQ
* RX = RADIO'S TRANSMIT FREQ

Figure 7-37
Dynamic Regroup
Menu Screen

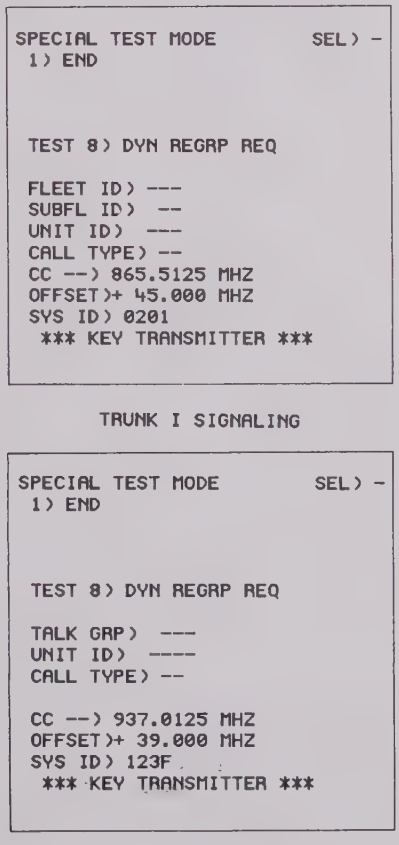


Figure 7-38
Dynamic Regroup Mode:
Start Test

```
SPECIAL TEST MODE          SEL) -
 1) EXIT
 2) RESET TEST


 TEST 8) DYN REGRP REQ
 FLEET ID) 307
 SUBFL ID)  07
 UNIT ID)  01E
 CALL TYPE) Y2

 CC --) 865.5125 MHZ
 OFFSET)+ 45.000 MHZ
 SYS ID) 0201
   *** TEST COMPLETED ***
```

TRUNK I SIGNALING

```
SPECIAL TEST MODE          SEL) -
 1) EXIT
 2) RESET TEST


 TEST 8) DYN REGRP REQ

 TALK GRP)  140
 UNIT ID)  01C0
 CALL TYPE) Y2

 CC --) 937.0125 MHZ
 OFFSET)+ 39.000 MHZ
 SYS ID) 123F
   *** TEST COMPLETED ***
```

TRUNK II SIGNALING

Figure 7-39
Dynamic Regroup Mode: Transmitter Keyed

The radio sends the R-2021D a dynamic regroup request ISW on the control channel. The R-2021D responds by sending acknowledge words on the control channel to acknowledge the ISW. The R-2021D then decodes the ISW and displays the radio's fleet ID, subfleet ID, unit ID (unit ID and talk group if Trunk II signaling) information and the call type.

The test ends automatically after the acknowledge is sent. the R-2021D displays a TEST COMPLETED message. See figure 7-39.

Appendix 1 Thermometer Graphics For Signaling Types

Radio Init Trunk I Signaling

The thermometer graphic displays the major signaling events that occur with Trunk I signaling during a Radio Init Test. Steps 1 through 8 test signaling ability and handshaking. Step 9 checks the frequency, RF, and modulation. These events are:

1) CC IDLE — The R-2021D outputs a background pattern on the control channel to lock the radio.

2) ISW RCVD — The radio has sent an Inbound Signaling Word, (ISW), on the control channel frequency to show that the radio has been keyed.

3) CHAN GRANT — The R-2021D is sending channel grant signaling words on the control channel. Channel grants tell the radio which voice channel to use.

4) OBD HS ACK — At the same time as the CHAN GRANT, the R-2021D is sending high speed acknowledge words on the voice channel.

5) IBD HS ACK — The radio is sending high speed acknowledge tone on the voice channel to show that it has received the OBD HS ACK on the voice channel.

6) OBD CONN — The R-2021D is sending an outbound connect word on the voice channel to show that it has received the IBD HS ACK on the voice channel.

7) CONN ON VC — The R-2021D has decoded the connect tone on the voice channel sent by the radio.

8) DISC RCVD — The radio has sent a disconnect tone to the R-2021D on the voice channel to show that it has dekeyed and is releasing the voice channel. DISC RCVD verifies the receipt of proper disconnect signaling.

9) DISC SENT — The R-2021D sends a disconnect word on the voice channel to end the call. The radio will return to the control channel.

Radio Init Trunk I Ep II Signaling

The thermometer graphic displays the major signaling events that occur with Trunk I EP II signaling and Trunk II signaling during a Radio Init Test. Steps 1 through 6 test signaling ability. Step 7 checks the frequency, RF, and modulation. These events are:

1) CC IDLE — The R-2021D outputs a background pattern on the control channel frequency to lock the radio.

2) ISW RCVD — The radio has sent an Inbound Signaling Word, (ISW), on the control channel to show that the radio has been keyed.

3) CHAN GRANT — The R-2021D is sending channel grant signaling words on the control channel. Channel grants tell the radio which voice channel to use.

4) OBD CONN — The R-2021D is sending an outbound connect word on the voice channel.

5) CONN ON VC — The R-2021D has decoded the connect tone on the voice channel sent by the radio.

6) DISC RCVD The radio has sent a disconnect tone to the R-2021D on the voice channel to show that it has dekeyed and is releasing the voice channel. DISC RCVD verifies the receipt of proper disconnect signaling.

7) DISC SENT The R-2021D sends a disconnect word on the voice channel to end the call. The radio will return to the control channel.

Radio Init Trunk II Signaling

The thermometer graphic displays the major signaling events that occur with Trunk II signaling during a Radio Init Test. Steps 1 through 8 test signaling ability and handshaking, step 9 checks the frequency, RF, and modulation. These events are:

1) CC IDLE The R-2021D outputs a background pattern on the control channel to lock the radio.

2) ISW RCVD The radio has sent an Inbound Signaling Word, (ISW), on the control channel to show the operator that the radio has been keyed.

3) TG GRANT The R-2021D is sending a Talk Group grant signaling word on the control channel.

4) DISW RCVD The radio has sent a second ISW on the control channel.

5) CHAN GRANT The R-2021D is sending channel grant signaling words on the control channel. Channel grants tell the radio which voice channel to use.

6) OBD CONN The R-2021D is sending an outbound connect word on the voice channel.

7) CONN ON VC The R-2021D has decoded the connect tone on the voice channel sent by the radio.

8) DISC RCVD — The radio has sent a disconnect tone to the R-2021D on the voice channel to show that it has dekeyed and is releasing the voice channel. DISC RCVD verifies the receipt of proper disconnect signaling.

9) DISC SENT — The R-2021D sends a disconnect word on the voice channel frequency to end the call. The radio will return to the control channel.

Controller Init Trunk I Signaling

The thermometer graphic displays the major signaling events that occur with Trunk I signaling during a Controller Init Test. These events are:

1) CC IDLE — The R-2021D outputs a background pattern on the control channel to lock the radio.

2) CHAN GRANT — The R-2021D is sending channel grant signaling words on the control channel. Channel grants tell the radio which voice channel to use.

3) OBD HS ACK — At the same time as the CHAN GRANT, the R-2021D is sending high speed acknowledge words on the voice channel.

4) OBD CONN — The R-2021D is sending an outbound connect word on the voice channel to show that it has received the IBD HS ACK on the voice channel.

5) DISC SENT — The SC R-2021D sends a disconnect word on the voice channel to end the call. The radio will return to the control channel.

Controller Init Trunk I Ep II or Trunk II Signaling

The thermometer graphic displays the major signaling events that occur with Trunk I EP II and Trunk II during a Controller Init Test. These events are:

1) CC IDLE — The R-2021D outputs a background pattern on the control channel to lock the radio.

2) CHAN GRANT — The R-2021D is sending channel grant signaling words on the control channel. Channel grants tell the radio which voice channel to use.

3) OBD CONN — The R-2021D is sending an outbound connect word on the voice channel.

4) DISC SENT — The R-2021D sends a disconnect word on the voice channel to end the call. The radio will return to the control channel.

Appendix 2 Error And Warning Messages

Errors

If an error occurs during a test, the test ends. To run the test again, correct the mistake and restart the test. Errors fall into two categories: setup errors and radio errors. Error numbers 1 through 9 are setup errors (only 1 through 5 are currently used); these occur when entered data is incorrect. Error numbers 10 through 29 are testing errors (only 10 through 16 are currently used); these errors are the result of a radio error. If a testing error occurs during the Variable Step mode of the Trunk Auto Test and the operator has selected the printer, the test automatically resets and progresses to the next voice channel. A summary of setup and radio error messages follows.

Setup Error Messages

Error 01
Invalid frequency

The control or voice channel entered is out of the valid frequency range, or the control channel is not in the correct position within the range, or the voice channel is not in the correct position with respect to the control channel.

Error 02 (Trunk I signaling)
Invalid fleet ID, subfleet ID, or unit ID

The value of the fleet ID, subfleet ID, or unit ID is greater than the maximum value for the size code value in the System Configuration screen. (The system ID determines the table used; the fleet prefix determines the size code used.)

Error 03
Invalid system ID

Shows the selected system ID in the Controller Init Test or one of the Special Tests is not one of the system IDs for the radio.

Error 04 (Trunk I signaling)
Invalid fleet map

The size code table in the System Configuration screen is incorrect for the system ID selected or the size code table is invalid for the data received in the ISW from the radio.

Error 05 (Trunk I signaling)
Invalid size code

The System Configuration screen contains an undefined size code for the system ID selected.

Error 06 (UHF 403-430 MHz)
Image/Duplex switch

The Image/Duplex switch is in the wrong position.

Error 07 (403-430 MHz)
DPLX offset > 10 MHz

The offset frequency between Transmit and Receive is greater than 10 MHz.

Testing Error Messages

Error 10
ISW data error

The ISW bit rate is incorrect or there is a parity check error in the data received.

Error 11
Acknowledge tone note received

The R-2021D did not receive the acknowledge tone in the time allowed.

Error 12
Connect tone not received

The R-2021D did not receive the connect tone in the time allowed.

Error 13
Timeout

The R-2021D did not receive a response from the radio in the time allowed.

Error 14
Incorrect call type received

This message indicates a radio problem. The operator attempted the wrong type of call the test mode selected on the R-2021D.

Error 15
Disconnect tone not received

Shows the R-2021D did not receive the disconnect tone.

Error 16
ISW not received

Shows the R-2021D did not receive the ISW from the radio in the time allowed.

WARNINGS

The R-2021D can also display warnings during a test. Unlike an error, the test continues if a warning occurs. The warning shows that the operator made a mistake. A summary of warning messages follows.

Warning 01
Invalid system ID

The system ID selected in the Radio Init or the Trunk Auto Test is not one of the system IDs for the radio.

Warning 10
Incorrect call type received

This message indicates a radio problem. The operator attempted the wrong type of call the test mode selected on the R-2021D.

Appendix 3 ISW Call Type Description

Trunk I Signaling Call Types

Apache Screen Value	Description of Call-Type
G1	5 Channel Subfleet Call Request
I1	20 Channel Level 1 Private Call Request
G2	20 Channel Subfleet Call Request
P2	Consolette Interconnect Request for: Subfleet Call
P3	Centralized Phone Interconnect Request for: Subfleet Call
Z1	Reserved for Data Channel Request
Z2	Reserved for SECURENET channel request
E2	20 Channel Emergency Call Request
X	1st word code for Dual ISW format
I2	Private Call Level II Request: 2nd word of Dual ISW.
Y1	Dynamic Regrouping Request Command: 2nd word of Dual ISW
Y2	Reserved for additional messages: 2nd word of Dual ISW
P1	Individual Interconnect Request/Response
S	System Wide Request
Z3	Res.-Sys. Definable Call Type
R	Interconnect Reject Request
MO • M7	Status or Message 0-7
A	Individual Call Alert Command or Acknowledge
E1	Emergency Alarm Message or Acknowledge
M10 • M15	Status or Message 10-15

Trunk II Signaling Call Types

Apache Screen Value	Description of Call-Type
P1	Individual Interconnect Request
P2	Centralized Interconnect Request for: Group-to-Land Call (reserved)
P4	Individual Interconnect; Mobile-Transpond-Response
R	Interconnect Reject Request
Z7	Not assigned
X1	1st word code for Dual ISW format
I2	Private Call II Chan. Request: 2nd word, Dual ISW.
Y1	Dynamic Regrouping Command: 2nd word, Dual ISW (SMARTNET)
X2	Extended Function Command; 2nd word, Dual ISW
G3	Un-affiliated Group Call Request: 2nd word, Dual ISW
X3	Reserved for: (SMARTNET) TALK GROUP ASSOCIATION; EMERGENCY ALARM, STATUS/MESSAGE, and DYN REPROGRAMMING; Dual (2nd word) code type
P5	Mobile-to-Land Subfleet Interconnect: 2nd Word, Dual ISW (SMARTNET)
M1	Reserved for AUTO. UNIT AFFILIATION; 2nd Word, Dual ISW (SMARTNET)
Z2	Type II Messages
S2	SECURENET (Indiv) Land-to-Mobile Interconnect (ICU comm)
S3	SECURENET (SBFLT) Land-to-Mobile Interconnect (ICU comm)
S4	SECURENET Secure SBFLT (affiliated); Single word request
S5, S6	Not assigned
I1	PC II-ENHANCED_RING 2nd word, Dual ISW
I3	PC II-ENHANCED_RING_ACK 2nd word, Dual ISW
A1	CA II-ENHANCED_RING 2nd word, Dual ISW
A2	CA II-ENHANCED_RING_ACK 2nd word, Dual ISW
Z1	Reserved for Data Channel Request
Z3	Reserved for System Definable Call Types (Wildcard)

Trunk II Signaling Call Types (Cont)

Apache Screen Value	Description of Call-Type
Z4, Z5, Z6	Not assigned
CM	Clear-voice Message Trunked talk groups
CA	Clear-voice Announcement talk groups
CE	Clear-voice Emergency talk groups
CP1	Clear-voice PATCH talk groups
CD	Clear-voice DATA talk groups
CEA	Clear-voice EMERGENCY Announcement groups
CP2	Clear-voice (RESERVED) Paging or AVL groups
CVM	Clear-voice (RESERVED) MSEL groups
SM	Secure-voice Message-Trunked talk groups
SA	Secure-voice Announcement talk groups
SE	Secure-voice Emergency talk groups
SP1	Secure-voice PATCH talk groups
SD	Secure-voice DATA talk groups
SEA	Secure-voice EMERGENCY Announcement groups
SP2	Secure-voice (RESERVED) PAGING or AVIL groups
SVM	Secure-voice (RESERVED) MSEL groups
TS1 • TS8	Type II Status 1-8
TE1	Talk Group Affiliated Emergency Alarm
TDR	Talk Group Affiliated Dynamic Reprogram Request
TDI	Talk Group Affiliated ACK DYNAMIC ID W/ OSW Assignment
TAA	Talk Group Affiliated ACK Announcement OSW Talk group assignment

Trunk II Signaling Call Types (Cont)

Apache Screen Value	Description of Call-Type
TDI	Talk Group Affiliated ACK DYNAMIC ID W/ OSW Assignment
TAA	Talk Group Affiliated ACK Announcement OSW Talk group assignment

Quick Reference Guide

Use this quick reference guide to perform trunking tests. For each test, this guide lists the following: the information to enter in the test screen, what the R-2021D checks before the test, what the R-2021D displays during the test, the thermometer description, and temporary exits. When applicable, the R-2021D also checks the control and voice channels.

Radio Init Test

Enter:
- Control channel frequency
- Voice channel frequency
- Duplex offset frequency
- System ID

Checks:
- System ID. (Trunk I signaling only)
  If system ID is not correct or if the system ID is FFFF, the R-2021D generates a WARNING 01 and cannot display the decoded information.

Thermometer:
- See Appendix 1.

Displays:
- Fleet ID (Trunk I signaling)
- Subfleet ID (Trunk I signaling)
- Size code (Trunk I signaling)
- Talk group (Trunk II signaling)
- Unit ID
- Call type
- Connect tone
- Frequency error
- Power
- Deviation

Temporary exit:
- Available after CONN ON VC step

Controller Init Test

Enter:
- Control channel frequency
- Voice channel frequency
- Duplex offset frequency
- System ID
- Fleet ID (Trunk I signaling)
- Subfleet ID (Trunk I signaling)
- Talk group (Trunk II signaling)
- Unit ID
- Call type

Checks:
- System ID. (Trunk I signaling only) If system ID is not correct, the R-2021D generates an ERROR 03

Thermometer:
- See Appendix 1.

Displays:
- Power

Temporary exit:
- Available after OBD CONN step

Trunk Auto Test

Enter:
- Control channel frequency
- Duplex offset frequency
- System ID
- Four voice channel frequencies (Frequency Table mode)
- Starting voice channel frequency (Variable Step mode)
- Skip factor (Variable Step mode)
- Printer on/off
- Auto key on/off

Checks:
- System ID. (Trunk I signaling only)
  If system ID is not correct or if the system ID is FFFF, the R-2021D generates a WARNING 01 and cannot display the decoded information.

Thermometer:
- Same as Radio Init Test

Displays:
- Fleet ID (Trunk I signaling)
- Subfleet ID (Trunk I signaling)

Size code (Trunk I signaling)
Talk group (Trunk II signaling)
Unit ID
Call type
Connect tone
Frequency error
Power
Deviation

Temporary exit:
Not available

Failsoft Test

Enter:
Failsoft channel frequency

Checks:
Failsoft frequency to be sure that it is a valid frequency

Thermometer:
No thermometer display

Displays:
The R-2021D does not display any information

Temporary exit:
Available any time after the test starts

Busy System Test

Enter:
Control channel frequency
Voice channel frequency
Duplex offset frequency
System ID

Checks:
System ID. (Trunk I signaling only) If system ID is not correct, the R-2021D generates an ERROR 03

Thermometer:
Same as the Radio Init Test

Displays:
The R-2021D does not display any information

Temporary exit:
Available after CONN ON VC step

Mobile Retry Test

Enter:
- Control channel frequency
- Voice channel frequency
- Duplex offset frequency
- System ID

Checks:
- System ID. (Trunk I signaling only) If system ID is not correct, the R-2021D generates an ERROR 03

Thermometer:
- Same as the Radio Init Test

Displays:
- The R-2021D does not display any information

Temporary exit:
- Available after CONN ON VC step

Radio Init Call Alert Test

Enter:
- Control channel frequency
- Duplex offset frequency
- System ID

Checks:
- System ID. (Trunk I signaling only) If system ID is not correct, the R-2021D generates an ERROR 03

Thermometer:
- No thermometer display

Displays:
- Target fleet ID (Trunk I signaling)
- Target subfleet ID (Trunk I signaling)
- Unit ID (Trunk II signaling)
- Target unit ID
- Call type

Temporary exit:
- Not available

Controller Init Call Alert Test

Enter:

Control channel frequency
Duplex offset frequency
System ID
Unit ID (Trunk I signaling)
Fleet ID (Trunk I signaling)
Subfleet ID (Trunk I signaling)
Calling ID (Trunk II signaling)
Target unit ID (Trunk II signaling)

Checks:

System ID. (Trunk I signaling only) If system ID is not correct, the R-2021D generates an ERROR 03

Fleet, subfleet, and unit ID values are not greater than the maximum values for the size code value in the System Configuration screen

Thermometer:

No thermometer display

Displays:

The R-2021D does not display any information

Temporary exit:

Not available

Radio Init Private Call Test

Enter:
- Control channel frequency
- Voice channel frequency
- Duplex offset frequency
- System ID

Checks:
- System ID. (Trunk I signaling only) If system ID is not correct, the R-2021D generates an ERROR 03

Thermometer:
- No thermometer display

Displays:
- Fleet ID (Trunk I signaling)
- Subfleet ID Trunk I signaling)
- Target unit ID (Trunk II signaling)
- Unit ID
- Call type
- Target fleet ID (Trunk I signaling, Level 2 call)
- Target subfleet ID (Trunk I signaling, Level 2 call)
- Target unit ID (Trunk I signaling, Level 2 call)

Temporary exit:
- Available after the voice channel activates

Controller Init Private Call Test

Enter:
- Unit ID
- Control channel frequency (Trunk II signaling)
- Voice channel frequency (Trunk II signaling)
- Duplex offset frequency (Trunk II signaling)
- System ID (Trunk II signaling)
- Target unit ID (Trunk II signaling)

Checks:
- System ID. (Trunk I signaling only) If system ID is not correct, the R-2021D generates an ERROR 03

Thermometer:
- No thermometer display

Displays:
- Call type

Temporary exit:
- Available after the voice channel activates

Dynamic Regroup Request Test

Enter:
- Control channel frequency
- Duplex offset frequency
- System ID

Checks:
- System ID. (Trunk I signaling only) If system ID is not correct, the R-2021D generates an ERROR 03

Thermometer:
- No thermometer display

Displays:
- Unit ID
- Fleet ID (Trunk I signaling)
- Subfleet ID (Trunk I signaling)
- Talk group (Trunk II signaling)
- Call type

Temporary exit:
- Not available

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Emergency Test

Enter:
- Control channel frequency
- Duplex offset frequency
- System ID

Checks:
- System ID. (Trunk I signaling only) If system ID is not correct, the R-2021D generates an ERROR 03

Thermometer:
- No thermometer display

Displays:
- Unit ID
- Call type
- Fleet ID (Trunk I signaling)
- Subfleet ID (Trunk I signaling)
- Talk group (Trunk II signaling)

Temporary exit:
- Not available

Radio Init Phone Interconnect Test

Enter:
- Control channel frequency
- Voice channel frequency
- Duplex offset frequency
- System ID

Checks:
- System ID. (Trunk I signaling only) If system ID is not correct, the R-2021D generates an ERROR 03

Thermometer:
- No thermometer display

Displays:
- Unit ID
- Fleet ID (Trunk I signaling)
- Call type

Temporary exit:
- After the radio is on the voice channel

Controller Init Phone Interconnect Test

Enter:

The R-2021D does not allow the entering of information (Radio Init Phone Interconnect Test must be performed first)

Checks:

System ID. (Trunk I signaling only) If system ID is not correct, the R-2021D generates an ERROR 03

Fleet, subfleet, and unit ID values are not greater than the maximum values for the size code value in the System Configuration screen

Thermometer:

No thermometer display

Displays:

Call type

Temporary exit:

After the radio is on the voice channel

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TEST EQUIPMENT SERVICE REQUEST FORM

This completed form must accompany equipment returned for service.

CUSTOMER'S PURCHASE ORDER NO.		DATE	
MODEL NUMBER		SERIAL NUMBER	
DESCRIPTION OF PROBLEM:			
REQUESTED SERVICE:			
SHIP TO ADDRESS:			
SHIP VIA:			

Providing the information below will reduce the turnaround time on your Test Equipment Service.

MOTOROLA CUSTOMER NUMBER	BILL TAG	SHIP TAG	INTERNAL MOTOROLA ACCOUNT NO.

SIGNED: _____

OPERATOR'S MANUAL
TRUNKED RADIO
TEST OPTION

R-2021D/0900
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